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Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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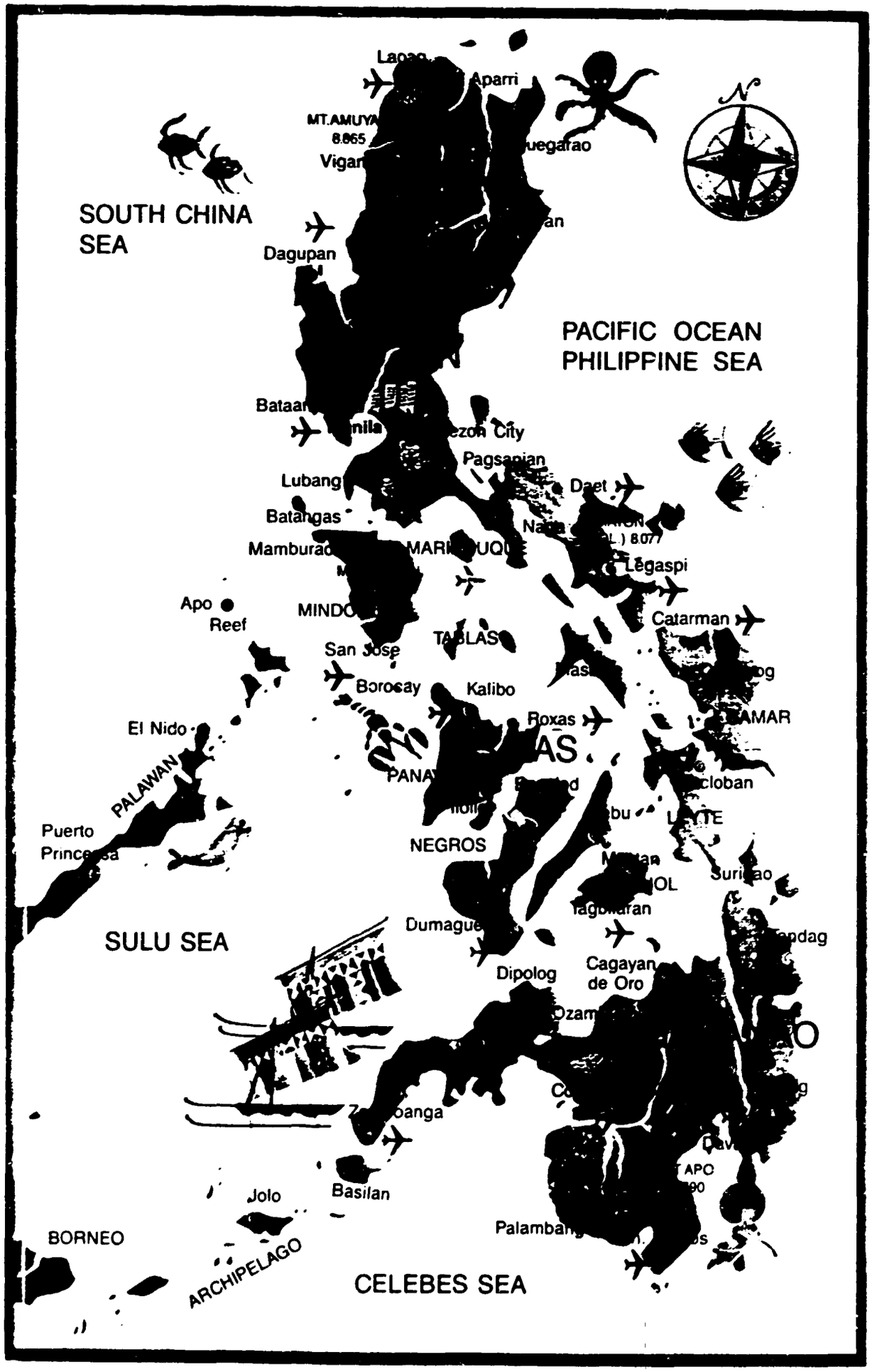
INFANT FOOD AND SNACKS IN THE PHILIPPINES

ITG
INTERNATIONAL TRADE
& TRAINING GROUP

00142 ROMA (EUR) - ITALY
19 VIA LUIGI [illegible]
TEL (06) 5192[illegible]a
TELEX 612332 GE[illegible]
TELEFAX (06) 5191323
CABLE ITGROM

1040 BRUXELLES - BELGIUM
9, ROND POINT SCHUMAN
TEL (02) 2310570
TLX 046/64119 LAWYER B
FAX (02) 2310603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INFANT FOOD AND SNACKS IN THE PHILIPPINES

ITG - International Trade & Training Group Srl

Rome - Italy

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Pre-investment Study for Infant Food and Snacks in the Philippines

(Project US/GLO/89/126)

DIAGRAMS

CHAPTER I

Executive Summary

CHAP. I EXECUTIVE SUMMARY

I.1 Project background

The pre-investment study was carried out by International Trade and Training Group (ITG) under the auspicies of the United Nations Industrial Development Organization (UNIDO) for

General Milling Corporation (GMC)
6th floor Corinthian Plaza
121 Paseo de Roxas
Makati Metro Manila PHI

in cooperation with

Pavan Mapimpianti S.p.A.
Via Europa, 27
35015 Galliera Veneta (PD) ITALY.

The project aims:

a) to asses consumption and market opportunities, to evaluate the available raw materials and distribution scheme and to develop means of producing infant food.

b) to develop test products, and define the optimal nutritional contents of the formulation.

It was considered important that the products be easy to stock and distribute. The projected products are all easy to prepare and consume since they are made of precoocked cereals flours. The first product category (as specified hereafter) is in powder form and can be dissolved in water or milk, while the second product category is ready to eat.

Due to the use of local raw materials the final product is low in price and it is possibile to choose various formulae and ingredients capable of satisfying particular nutritional needs by adding vitamins, flavours or particular additives.
The project objectives are wide-ranging and all equally valid and practicable. The project is an integral part of a wider scheme aimed at implementing a social prcgram and developing certain economic and production sectors in the country.

The project is targeted to:

(a) improve the general nutritional status of the country;

(b) increase access to the types of infant foods which are at present imported and which only a small proportion of the population can afford;

(c) utilize the indigenous food crops efficiently for the production of nutritious baby foods;

(d) save hard currency by import substitution;

(e) contribute to the improvement of standards, food composition, packaging and informative labelling in the food industry;

(f) develop new types of nutritious foods;

(g) achieve state of-the-art technologies in the food industry.

This joint venture will help to further the diversification of infant foods in the Philippines, expand the market for these products and optimize food distribution channels. PAVAN MAPIMPIANTI will play a major role in all aspects of the project, in particular with regard tc the transfer of technology and know-how.

I.2. Market and Plant capacity

The target group studied is mainly made up of by women and very young children. The report analyses the socio-economic conditions and nutrition standards of this target group in order to estimate the size of the demand for low cost nutritious products.

The target group comprised:

- children between 6 months and 3 years (weaning food)
- children from 3 - 6 years (breakfast cereals)
- children from 6 years upwards (breakfast cereals + snacks)
- pregnant and nursing women (instant powder foods/breakfast cereals).

Of course, products such as instant powders, shaped cereals and snacks can be utilized by different groups of consumers, depending on their age, income, and the opportunities they have for using them (shaped cereals, for example, are usually consumed as breakfast cereals, while suitable snacks can be part of nutrition education programs in schools,and/or used as ingredients for cereal bars. Snacks can also enrich vegetable soups, while instant powders can supplement the diet of the elderly or people suffering from stomach, digestion, and/or dental problems, etc.).

In order to satisfy the needs of the above target group (infant population) the following products will be produced:

A. Pre-cooked weaning food (PWF) comprising two main categories of products:

A1 - baby food with powdered milk (PWF1). These products have a higher price and greater profit margin;

A2 - cereal based baby food (PWF2). These products are lower priced and therefore have a smaller profit margin.

B. Infant shaped cereals (ISC):

B1 - multicereals (MSC)

B2 - high protein (HPSC),

On the basis of local market research and available statistical data, the following results were obtained for the Philippine market:

A) Cereal based baby foods: (PWF) actual market size is 1000 tpa.
Growth rate : (1989-90)+ 43.5% (volume)
+ 58.8% (value)

Market value: 91 millions P
Imported products:account for 4% of the market volume
Projected market growth rate:

91	92	93	94	95	
+40%	+35%	+30%	+25%	+20%	volume
+50%	+45%	+40%	+35%	+30%	value

The above market indicators refer exclusively to cereal based baby foods. These foods are part of a much larger group of infant food products which includes: flour preparation for infant foods, hypoallergenic milk, soya, etc.

In the Philippines, this group of products has a current market of US$ 55 millions which is largely made up of imported goods.

PWF 1 and 2 could, therefore, well break into this market sector and would be capable of:

- competing with similar products produced by Nestle (local production);
- replacing similar quality/lower price imported products (Milupa and Gerber)
- replacing similar quality/lower price imported products,(powder milk, hypoallergenic soy food, instant flour preparation, etc.) which have the same target group (babies and children from 0 to 6 years).

B) Infant shaped cereals and snacks: the market segment for breakfast cereal products and cereal/potato snacks has been analysed as one, since the products have similar characteristics:

The overall market value was estimated at US$ 20 millions.

Infant breakfast cereals

- imported goods have increased from 264.705 kg (1988) to 1.383.492 kg (1990) for a total value of US$ 1.841.000.

Snacks

- market size: 31.100 tpa (1990)
- market value: 411.089.000 P
- market growth rate: +29% (volume)
  + 28% (value)

- projected market growth:

91	92	93	94	95	
+22%	+22%	+20%	+20%	+20%	volume
+27%	+27%	+25%	+25%	+25%	value

Products B1 and B2 are formulated to satisfy specific nutritional requirements. Product B1 utilizes locally available cereal flours and B2 is protein enriched.

However, it must be noted that these products are only two examples of the many possible products that the plant discussed in this project can produce in terms of processable flours and additional ingredients.

Since the production process involved in manufacturing B1 + B2 products is very versatile, it is possible to produce pellets which can be expanded into snacks using the same technology.

Snacks are a different product category and generally well-liked on the Philippine market. Puffed snacks (directly expanded) and potato crisps are the principal products.

Pellets could therefore be put onto the snack savoury market, using higher value added packaging and be targeted at a different segment of the population than that interested in infant foods.

As snacks are considered an impulse food, their consumption is concentrated in the metropolitan areas and they are generally targeted at a more adult population.

In estimating of the market potential and product penetration force, and therefore, the extent to which these new products are competitive in the Philippines, it is also important to remember that GMC is a major food producer in this country. Its name and organization are therefore more than capable of competing with multinationals and other food producers. Neither should it be forgotten that part of GMC's products are exported to important markets such as USA.

While visiting the Philippine supermarkets to carry out the field study for this project, it was noted that in all of them some shelves were displaying pasta products.

Reports indicate that pasta is consumed by all family members, including school children. The actual market size and growth rate indicate that in terms of availability of raw materials, nutritional value, low cost and convenience pasta is quite an interesting product for the Philippine market.

This market segment has been analyzed in the attached tabels since:

- GMC already produces pasta, part of which is exported abroad. As a result GMC already possesses the necessary know-how for pasta production;
- PAVAN MAPIMPIANTI technology in this field is the most advanced in the world.

In order to evaluate the market size and potential not only the statistical data and production/consumption rates, but also the following factors, were considered:

. organisation of offer and distribution
. population growth rate
. target group growth rate
. malnutrition problems
. geographical distribution of malnutrition.

The range of products proposed (i.e. cereal based baby foods, breakfast cereals, snacks) can be marketed within the present distribution network and can exploit the existing organizational structure without having any adverse effects on distribution costs, which remain basically the same as for other food products.

Demand is concentrated in poor urban districts and remote rural areas. Rapid migration towards the urban centres has lead to increased poverty, mainly among women and young children, and has aggravated the existing dearth of good nutritious food, and the poor health and sanitary conditions. This low income group is also found in rural areas where access to food can be crucial.
In these areas, alongside these low income groups, there are, of course, higher income groups, that already buy this type of products (Manila) or would do so if they were available (rural areas).

The production plant outlined in this project will have an yearly output of:

- 1050 tpa of precooked weaning foods (PWF1+PWF2)

- 1780 tpa of shaped breakfast cereals (MSC+HPSC).

This production output is but one of the possibilities since the plant is particularly flexibile with regard to the of raw materials it can process, the formulae employed and the possibility of switching production from one type of product to the other.

I.3 Material and inputs

The products required for producing cereal and based baby food are: cereal flours and rice, maize or wheat, or mixes, skimmed milk powder, defatted soya flour, vegetable oil and cane sugar.

Wheat, rice and maize can be used to produce flour with a 81% and 89% extraction rate respectively. As GMC is a milling company, the regular supply and availability of such items is guaranteed.

- The minimum quantity of rice required is 1.250 tpa. Rice is widely cultivated and accounts for 16% of total agricultural production. In 1988, paley production totalled 8.971 tons.

- The minimum quantity of corn flour required is 640 tpa. In 1988 maize production totalled 4.428 tons.

- The minimum quantity of wheat flour required is 300 tpa. Wheat flour is currently produced by 8 milling companies which grind 1.100.000 tpa of imported wheat grains, which has the advantage of being subject to special import procedures.

- Skimmed milk powder and defatted soya flour are not produced in the Philippines. However only a minimal quantity of approximately 500 tpa is required.

- Vitamins and minerals are also imported but they are considered as microingredients in this type of production.

As stated above, there is the possibility of changing the product formulae according to marketing requirements, nutritional needs, local availability of raw materials which are not fully exploited.
As a result products can be created containing other high proteic flours (banana, tapioca, pulses) or ingredients (fish paste or flour, dry vegetables, sweetenings, fats and oils).

I.4 Location and site

The plant is to be installed in the rural area of Cebu in line with government policy, which aims at decentralizing industrial plants from urban to rural areas in order to stimulate economic and manpower development outside Manila.

As mentioned above production is programmed to start in an already existing plant in the GMC production area, in Cebu (Central Visayas). The plant is part of the GMC production centre and is already equipped with the services necessary for receiving raw materials, and transporting and distributing the finished products.

I.5 Project engineering

The type of technology adopted in this project is testimony to the experience of PAVAN MAPIMPIANTI in the food production, and particularly baby food, sector.

The choice of production process is dictated by current technology in this sector.

The technology employed is based on the exploitation of local raw materials and aims at obtaining a highly nutritious product which, due to the low production costs, can be sold at a price low-income groups can afford.

The particular technology adopted was chosen on the basis of a number of different factors such as: market considerations, nutritional requirements, availability of raw materials and plant flexibility.
The selected technology used for producing precooked weaning food, is based on low-shear extrusion cooking. This process has many advantages vis-a-vis the drum drying technology otherwise used in PWF production.

Extruders are particularly versatile and capable of handling a wide variety of raw materials and producing various products, with maximum cost effectiveness.

The technology has been successfully applied to the production of various food items such as pasta, pellet snacks, reformed chips, laminated snacks, and breakfast cereals.

I.6 Plant organization and manpower costs.

The plant organization for the infant food factory is based on a combined assessment of the project engineering requirements and current Philippine factory standards.

The factory is headed by the General Manager and will be organized into four different cost centres each with its own Head of Department.

1. Marketing and Sales
2. Operations
3. Finance
4. Administration.

The fact that the production line is to be installed in an existing production organization is seen as one of the critical factors which will contribute to the success of the project.

GMC can not only provide an already existing production organization, but also an important marketing and distribution network, as well as trained management and labour.

These factors will, without doubt, help to make it easier to reach full production capacity quickly, which is scheduled, according to a conservative estimate in three years.

The new project will generate at least 68 new jobs of which 34 workers will be directly involved in the processing area. A further 34 workers will be employeed in the administrative, marketing and financial departments.

A major training programme will guarantee the correct transfer of technology and will help improve the already high level of skills among Philippine technicians.
As the new factory has been considered a division of GMC and part of the existing structure rather than as a new company, many costs (mainly fixed) have been considered as a percentage of the overall structure costs.

I.7 Project implementation

The project will be organized in 4 overlapping phases:

1. Design, tender and implementation of civil works, including the preparation of all civil/structural designs related to the modifications which will have to made to the complex: Months 1 - 5

2. Equipment procurement, supply, installation and final commissioning:
   Months 2 - 12

3. Training of Philippine Personnel: Month 8

4. Technical assistance, to be provided after production has started in 3 periods of 15 days each, every 4 months.

I.8. Economic and financial evaluation

The programme for the construction of a Baby Food plant in the Philippines was part of a proposal made by the Italian Government to grant aid to the Philippine Government within the framework of a bilateral agreement between the two countries.

UNIDO was to provide technical, economic and financial support for the programme.

The agreement provided for joint ventures to be set up between Italian and Philippine companies.

According to the letter of intent finalized during the Manila Investors Forum the plan to construct a baby food plant came within the political and strategic policy pursued by the Italian and Philippines Governments.

Since then the funds ear marked by the Italian government for aid to developing countries have been cut drastically and therefore all programmes have been either postponed or are to be reviewed.

The project has been affected by those changes and as a consequence it was necessary to find other sources of financing. The project was therefore drawn up in such a way as to take account of the present and future market situation in the children's food sector with respect to low and higher income categories in the population, for the purpose of increasing the overall profitability. This way necessary in order that the project be bankable.

Economic Analysis

In view of the market situation and probable market developments, and thanks to the technology employed, it will be possible to define the range of products to be marketed in the light of market fluctuations at any one moment (changes in consumers attitude, etc.), utilizing local raw materials, never taken into consideration previously, to develop products in different price categories.

This favourable constellation will make it possible to penetrate the market effectively.

The type of products offered should be introduced on-to the Philippine market with the support of an adequate advertising campaign. According tc our analysis, this market is highly competitive due to the presence of well known and established producers who, particularly with regard to PWF, have a monopoly control of the market. Therefore the products should be launched at different levels in order to stimulate demand for other similar products.

PWF would be launched on the market with the aim of competing with Nestlé and gaining a market share over and against imported products. Furthermore the fact that the goods have a lower price compared to similar products, due to the fact that they are made of local raw materials, will help boost demand.

PWF2 is targeted at consumers who cannot afford Cerelac or Ceresoy (Nestlé) but who have sufficient purchasing power to buy their children nutritious food based on cereals.

Other marketing strategies have not been analysed. It might, for example, be possible to launch the PWF2 product initially, and then compete in the higher added value segment once the brand is well established.

Moreover it is important to examine the possibilities offered by the government or specialized entities of introducing the product into school programmes and infant assistance or nutrition education schemes, etc.

As far as the other type of product, Instant Shaped Cereal, is concerned the marketing startegy is quite different. In this case, the aim is to gain a large share of the market by offering products which are of a better quality than those produced with less refined technologies and more competitive than imported products which cost more.

The products are mainly targeted at children between 3 and 6 years (up to 10), who would consume them with milk for breakfast (this does not preclude other possibilities of using them, such as snacks - to which honey, sugar, fruit, etc., could be added).

The competition will therefore be among products sold as breakfast cereals. There are, however, in the main generally imported or , if locally produced, of inferior quality from a nutritional point of view.
A competitive edge is furthermore to be gained over and against other producers by selling the product on a more profitable market segment, such as "Snack Foods".

These products are ready to eat. Thanks to the technology used it is possible to offer the product in different shapes and made up in various ways, as well as coated with sugar, chocolate, etc.
According to the estimate the project is attractive from a profit point of view, with a ROI (at full capacity) ranging from 13% during the period of loan repayment to 17.4% after 10 years.

Despite the combination of a cautions production programme and aggressive marketing policy the figures show a net profit of US$ 127,100 in year 2, which reflects a cost structure with a low incidence of fixed costs and a low breakeven profit.

Financial Analysis

As far as financing is concerned, two possibilities have been examined.

The main problem is related to the payment of the production plant, as the local expenses will be covered by GMC with Equity.

Pavan Mapimpianti will contribute with an equity participation of US$ 250 [illegible]. The value of "the transfer of technology" will be guaranteed by a training and technical assistance programme.
Solution A provides for a commercial line of credit in the amount of US$ 4,680,000 to be paid:

- US$ 700,000, equal to 15%, as down payment,
- US$ 3,980,000, equal to 85%, with a foreign loan at the following conditions.

. rate of interest = 10%
. period of grace = 2 years
. duration = 6 years.

Solution B provides for a grant for the purchase of part of the plant (additional equipment to produce PWF) amounting to US$ 1,580,000.

The remaining amount (US$ 3,100,000) will be paid according to the same scheme:

- US$ 465,000 (15%) as downpayment
- US$ 2,735,000 (85%) with a loan at the same conditions as above.

The results of the capital budgeting analysis are interesting in both cases, with a good IRR on total investment of 16%. (See in detail chap. 10).

Apart from the financial and economic data, however the second alternative is important for another reason.

It should be pointed out, namely, that the introduction of a baby food product such as PWF must be seen as an important strategy for resolving nutritional problems in developing countries.

Various attempts to face this problem have been undertaken, but very often with disappointing results. This is due to the fact that public development aid has often been given to Institutes unequipped to deal with such schemes.
This type of project, particularly if it is industrial, must be implemented by well equipped, well organized bodies capable of handling such a initiative successfully, a condition which, especially in developing countries, is to be found in the private sector. GMC is a classic example.

It is to be hoped that public bodies in the Philippines will support this type of scheme, which should be given priority in order to further the economic and social development of the country. Part of the funds allocated within the framework of bilateral aid should be used for the development of private industry.

These organizations should bear in mind that any, even partial efforts they make to support the project will help ensure its success and will lay the foundations for a development model which could be repeated in other countries and therefore guarantee economic and social development.

I.9 Conclusions.

From the present report it is apparent that:

- the present size of the Philippine market for cereal based infant foods, i.e. precooked weaning foods and infant shaped cereals, is such that there are good possibilities of introducing new products.

- present demand is certainly determined by the limited choice of available products. The yearly growth rate indicates a sharply increasing demand for high quality/low price products, which is only partly satisfied by local production and imported products.

As a result, market demand can be stimulated by offering a new range of products, produced locally and tailored to local nutritional requirements, as can be seen from the FNRI survey regarding the utilization of local crops for the development of new infant products (see appendix III).

- Population growth and average income are crucial factors affecting the development of the market. However, the different market position of each of the products analyzed (PWF1, PWF2, ISC, HPSC) dovetails with the present situation in the Philippines. Here, namely, demand for high quality products is concentrated in urban areas (Manila), as is shown by the preference given to Nestlé and imported brands, whereas there is a total dearth of products lower down the scale for the poor rural areas, which need nutritious food (target infant population) at prices within the consumers' reach.

These products must be considered as supplementary and are not meant to replace the staple food diet. As a result they have been developed in order to address specific nutritional needs and deficiencies.

As far as precooked weaning foods are concerned a portion of 50/60 g/day supplements the diet well, without either replacing local staple foods, which are generally within customer's reach in terms of availability and price, or changing the local dietary habits.

Supplementing the daily diet of the young population with these instant powders and breakfast cereals will also further the development of an awareness of food and health consciousness, which are generally lacking in the lower income groups or remote rural areas. In such areas scarce attention is paid to food combinations, hygiene or food preparation, and there is little awareness of the importance of a well balanced diet of cereal based products etc..

- With regard to exports it must be noted that GMC has already set up business relationships with major markets such as USA and Far East Countries for food products from the Philippines.

CHAPTER II

Project Background and History

CHAP. II Project background and history

II.1 Introduction

The present project was presented during the Manila Investors Forum held in Manila from 7th to 10th November 1988.

Several Philippine sponsors were interested in the production of baby foods and snacks for babies and school-age children.

Representatives of Pavan Mapimpianti contacted several Philippine industrialists, including General Milling Corporation (GMC).

II.2 Project background

The Philippine sponsors were favourably impressed with the experience Pavan Mapimpianti has gained in cooperating with developing countries.

A proposal was later developed jointly with GMC to set up an industrial operation for the purpose firstly of manufacturing nutritious food products on the spot, using local raw materials, and secondly, of developing products most suited to the Philippine market.

Several meetings were held between the two parties, both in Italy and in the Philippines, where the possibilities of utilizing PAVAN MAPIMPIANTI's innovative technology were discussed.

During these meetings they agreed:

- to cooperate for the purpose of setting up an industrial project geared to produce baby foods and snacks for school-age children, which would be most suited to the market and make use of raw materials available in the Philippines.

- to provide for the setting up of a laboratory for nutritional analysis and quality control, which would make it possible to achieve an optimal balance from a nutritional point of view. This was seen as an important part of the project.

In particular, they drew up the following schedule:

a. Preliminary feasibility study to be carried out jointly by PAVAN MAPIMPIANTI and GMC:
   a.1 to assess consumption and market opportunities, to evaluate the available raw materials and distribution scheme.
   a.2 to develop test products and define the optimal nutritional contents;

b. procurement of equipment for laboratory research, and industrial production;

c. training of GMC's technicians both in Italy and the Philippines;

d. construction, start up and management of the plant;

e. technical assistance after the start up.

II.3 Project parameters and guidelines

II.3.1 Product and product mix

This study covers the project for the installation of an industrial plant in the Philippines geared to the production of:

A) Pre-cooked weaning food, (PWF) comprising two main categories of products:
   - A1 baby food with powdered milk (PWF1). These products have a higher price and greater profit margin;
   - A2 cereals based baby food (PWF2). lower price/smaller profit margin.

B) Infant shaped cereals (ISC)
   - B1 multicereals (MSC)
   - B2 high protein (HPSC)

By and large, products A are targetted at the infant population from 5/6 months to 3 years; products B are for pre-school children from 3 to 6 years.

At the present time, these types of products are generally available on the market and largely accepted by the population.

II.3.2 Plant capacity and location

Following discussions with GMC, it was decided that the plant should be in Cebu, where GMC runs part of its operations and a factory is available for housing the production plant.

Plant capacity will be roughly 3.000 tpa, which will make it possible to produce a mix of products capable of meeting local market requirements, and, in part, to substitute the present imported goods.

II.3.3 Project orientation

The present project aims at:

- exploiting local raw materials, in particular cereal flours (rice, corn, wheat), pulse flours, dried vegetables, sugar, milk powder;

- improving the general nutritional status of the target population.

II.3.4 Socio-economic situation in the Philippines

The Philippine economy has all the typical characteristics of a developing country that, thanks to an abundance of raw materials and the existence of local manpower is aiming at economic industrialization and independence.

During the first half of the 80's the country lost sight of this objective due to a social-political, rather than economic, crisis.

The Philippine revolution of 1986 set a transformation process in the country's economy in motion.

The Government changes and the reforms undertaken by the new administration had a positive impact at first. The various sectors of the economy showed a certain dynamism thanks to the confidence that entrepreneurs and both Philippine and Foreigner investors had in the new administrative framework.

Politic stability contributed to the growth of a favourable atmosphere for new investments and the extension of those already in existance.

This confidence and optimism on part of the economic operators stimulated economic, commercial and industrial activity and laid the foundations of the Philippine economy.

Signs of economic expansion were clearly visible during the 1987 - 1989 period: GNP registered a considerable growth, even if the annual rate was inferior that of other countries in the same area; exports of manufactured goods, especially in the field of light industry, such as electronic goods, clothing and house products, increased considerably; energy consumption rose to high levels and building increased considerably; imports in general were up while unemployment fell. Furheremore there was a substential increase in investments by Philippine and foreign investors.

In 1990 the situation changed. Exports slowed down, while imports rose constantly bringing the balance of payments deficit near to US$ 4 billion; foreign investments fell which reflected devaluation of 11,8% against 1989. However the foreign debt service started to improve again in 1990.

II.3.5 The magnitude of poverty and its trend

Despite a per capita income of approximately US$ 590 there is still a large amount of both absolute and relative poverty in urban and rural areas in the Philippines.

The absolute poor are those with a household income below the substsitance level, estimated at 24.000 pesos per years (1985). The poor are predominantly rural people, with 70% of all poor families living in rural areas.

The 1985 Family Income and Expenditiure Surveys (FIES) indicated that as many as 58% of rural households were living in poverty (below a poverty line income of 15.000 pesos at 1985 prices).
According to official estimates calculated by the National Economic Development Authority (NEDA) 62% of rural households were living below the poverty line in 1985.

It was estimated that appoximately 30% of rural households, that is the lowest income group, suffer from starvation.

Distribution of Total Annual Family Income by Region 1971 and 1985.

Region	1971 %	1985 %
Philippines	100.0	100.0
National Capital Region	22.4	24.7
Region 1 Capital Region	6.7	7.3
Region 2 Cagayan Valley	3.2	4.1
Region 3 Central Luzon	12.3	12.2
Region 4 Southern Luzon	11.2	12.7
Region 5 Bicol Region	5.8	4.3
Region 6 Western Visayas	8.7	7.2
Region 7 Central Visayas	6.4	5.4
Region 8 Eastern Visayas	4.1	3.3
Region 9 Western Mindanao	3.9	3.8
Region 10 Northern Mindanao	4.0	4.9
Region 11 Southern Mindanao	6.1	6.6
Region 12 Central Mindanao	5.3	3.4

Sources of basic data:

Family income and Expenditures Survey.

The more rural islands are becoming poorer and poorer in relation to the more urbanized areas.

Average Real Family Income in pesos, 1971 and 1985 (1978 pesos)

	1971		
	Total	Urban	Rural
Average	9387	14741	7080

	1985		
	Total	Urban	Rural
Average	8806	13081	6204

Source:
Philippines the Challenge of Poverty, World Bank (1988).

II.3.6 Rapid Urbanization

It is important to consider the pattern of growth of the population over the last ten to twenty years. In the late '70's there was a sharp increase in the country's urban population, which accounted for 38% of the total population in 1980.

Rapid migration into the metropolitan region was far more important than any other pattern of migration.

It is interesting to note that among migrants to Metro Manila, a large number of females are mainly employed in the industrial sector.

II.3.7 Nutritional conditions

From the survey and analysis of the nutritional situation in the Philippines, it can be seen that rice is the major ingredient of the food diet, followed by other cereals, and fish (tab. 1.a and 1.b).

Althcugh this general diet is perfectly in line with international guidelines the data show that 71% of households suffer from malnutrition because the quantities of food consumed are minimal and there is a lack of variety.

Moreover, since 30% of households are considered "poor" or have very low incomes, (average family income ranging from US$ 2,800 to 1,400 per/year), malnutrition may also be due, in part to this factor and to the fact that only a small prportion of family income is allocated to food.

According to analyses carried out by the Food National Research Institute (FNRI), the young members of the family in particular, a target population from 0 to 6 years representing 16/17% of the total population (tab 2), suffer from malnutrition.

Although the overall situation is improving year by year, the Philippine food programs still consider children from 0 to 4 years as the minimum target population (tab.3 and 4).

In this group breast feeding is the main form of feeding for children up to 2 years, with the exception of Metro Manila area, Southern Tajolay, Western and Northern Mindanao, where breast feeding is replaced by bottle feeding as of 5 months (generally in the form of powder milk imported from abroad).

Geographically speaking figures for malnutrition are particularly high in some areas of the Philippines (tab. 5).

The results of the FNRI survey show that the most vulnerable population is made up of pre-school children, school children and pregnant/nursing women, and the areas most affected are:
Visayas, Wester and Central Mindanao, urban poor and the rural sectors.

II.3.8 Project promoters

The project was carried out jointly by
Pavan Mapimpianti S.p.A.
Viale Europa, 27
35015 Galliera Veneta (PD) ITALY

and

General Milling Corporation
6th floor, Corinthan Plaza
121 Paseo de Roxas
Makati, Metro Manila PHI.

Pavan Mapimpianti is an Italian company, and a leading supplier of production plants and equipment to the food industry . Pavan Mapimpianti has been operating for 40 years and has set up plant installations successfully in more than 90 countries all over the world.

GMC is a major food producer in the Philippines, employing about 4000 people nationwide. The company's committment to the food industry has resulted in GMC's recognition as a leading manufacturer of high quality food products.

Established in 1958, General Milling Corporation started operations primarily in the flour milling sector. The range of products has since been expanded to include feed milling, as well as the manufacture of corn starch, corn grits and oatmeal. Today, operations include the manufacture of consumer products such as snackfood, pasta, instant noodles and cooking oil.

II.3.9 Pre-investment project costs

Part of the costs related to this study were sustained and shared by the two companies involved, i.e. Pavan Mapimpianti and General Milling. The two partners decided not to include these costs in the pre-investment project costs as they fell within the scope of company normal operations, namely, marketing for GMC and design and engineering for Pavan Mapimpianti.

CHAPTER II

TABLES

CHAP. II TAB. 1A

FOOD GROUP/ITEM							
REGION		FRESH FISH	PROCESSED FISH	PORK	BEEF	CHICKEN	EGG HEN'S
Grams, Raw As Purchased							
PHILIPPINES		87	14	20	7	15	13
National Capital Region		74	10	36	11	30	18
Areas Outside NCR							
I	Ilocos	65	11	23	7	12	14
II	Cagayan Valley	50	13	30	8	18	19
III	Central Luzon	67	14	29	9	25	16
IV	Southern Tagalog	86	10	25	6	17	16
V	Bicol	106	15	15	5	12	11
VI	Western Visayas	98	15	13	7	10	9
VII	Central Visayas	96	13	17	6	13	15
VIII	Eastern Visayas	103	11	15	4	8	11
IX	Western Mindanao	125	22	14	8	14	14
X	Northern Mindanao	82	17	17	8	14	14
XI	Southern Mindanao	74	13	17	6	15	12
XII	Central Mindanao	79	14	16	8	14	11

CHAP. II TAB. 18

Per Capita Consumption on Selected Food Groups/Items by region, Philippines, 1989-90

REGION	Food Group/Item							
	RICE	Corn Grits	Pan de sal and other bread	Rootcrops	Cooking banana (Saba)	Sugar	Cooking Oil	Coconut Matured
	Grams, Raw As Purchased							
PHILIPPINES	308	41	30	19	15	31	12	31
National Capital Region	254	0	52	6	6	36	14	20
Area outside NCR								
I. Ilocos	332	2	27	4	1	34	12	5
II. Cagayan Valley	365	1	23	5	1	29	15	9
III. Central Luzon	317	0	44	11	5	38	15	12
IV. Southern Tagalog	312	0	39	12	10	39	14	35
V. Bicol	321	4	33	67	18	34	11	74
VI. Western Visayas	353	3	25	5	8	28	9	24
VII. Central Visayas	238	145	26	12	23	25	11	35
VIII. Eastern Visayas	347	17	25	44	8	29	10	52
IX. Western Mindanao	290	103	15	40	44	36	11	38
X. Northern Mindanao	308	57	22	22	24	30	12	36
XI. Southern Mindanao	303	59	29	7	14	30	11	28
XII. Central Mindanao	337	27	28	17	22	29	11	31

CHAP. II TAB. 2

PERCENTAGE OF NUTRITIONALLY-AT-A-RISK 0-6 YEARS OLD FILIPINO CHILDREN: PHILIPPINES, 1978, 1982, 1987 and 1989-90

NUTRITIONAL STATUS	1978 n=3400	1982 n=3634	1987 n=3421	1989-90 n=8008
Underweight (85% and below of standard weight-for-age)	21.9	17.2	17.7	14.0
Stunted (below 90% of standard weight-for-age)	-	20.6	14.1	11.6
Wasted (below 85% of standard weight-for-height)	13.8	9.5	12.7	9.0
Both wasted and stunted (below 85% of standard-weight-for height and below 90% of standard height-for-age)	-	2.0	2.1	1.4

CHAP. II TAB. 3

Percentage distribution of 0-6 year old Filipino children by nutritional status/using combined weight-for-height and height-for-age by region: Philippines, 1989-90

REGION	Total Subject	Normal	Wasted Only	Stunted Only	Both Wasted and Stunted
PHILIPPINES	8008	80.9	7.6	10.1	1.4
National Capital Region	834	84.8	9.2	5.2	0.8
Area outside NCR					
I. Ilocos	728	84.4	7.9	6.2	1.5
II. Cagayan Valley	628	84.3	7.9	7.1	0.6
III. Central Luzon	625	79.5	7.8	10.8	1.9
IV. Southern Tagalog	1146	81.7	8.9	7.9	1.5
V. Bicol	623	74.6	8.9	13.5	3
VI. Western Visayas	520	79.7	7.2	11.5	1.6
VII. Central Visayas	312	79.1	8.1	11.4	1.4
VIII. Eastern Visayas	520	75	7.5	15.3	2.1
IX. Western Mindanao	520	80	8.1	11.7	0.2
X. Northern Mindanao	623	85	5	9	1.1
XI. Southern Mindanao	513	83.8	7.4	8.1	0.8
XII. Central Mindanao	416	85.3	4.2	9.1	1.4

CHAP. II TAB. 4

Percentage of underweight (75% and below of standard weight-for-age) 0-6 year old Filipino children by tipe of farmers and farming system by region, Philippines, 1980-90

REGION	Total Number of Children	Type of Farmers					Farming System	
		Large Farm Managers/ Owners	Small Farm Managers/ Owners	Farm Laborers	Share Tenants	Kaingeros	Irrigated Farm	Non-irrigated Farm
PHILIPPINES	2211	1.5	3	4.1	6	0.1	5.4	10.3
National Capital Region	-	-	-	-	-	-	-	-
Area outside NCR								
I. Ilocos	176	-	3.2	1.1	10.1	-	4.6	10
II. Cagayan Valley	287	0.1	3.2	2.6	5.8	0.2	10.4	1.6
III. Central Luzon	204	1.8	2.6	8.2	2.6	-	12.4	2.8
IV. Southern Tagaloy	227	1	1.5	4.6	3.6	0.1	3.7	17.2
V. Bicol	170	4.3	6.2	4.4	6.8	-	4.5	17.2
VI. Western Visayas	117	-	2.3	12.5	5.4	-	3.5	16.7
VII. Central Visayas	61	-	3.4	3.8	8.5	-	3.3	12.7
VIII. Eastern Visayas	149	2.4	3.6	2.7	18.9	-	8.5	19.7
IX. Western Mindanao	161	4.4	1.5	2.2	3	-	1.5	9.6
X. Northern Mindanao	271	2.2	3.5	1.8	3.3	-	4.1	6.9
XI. Southern Mindanao	196	3.2	4	2.5	5.8	-	8.3	7.2
XII. Central Mindanao	192	1.2	3.2	-	7.5	-	6.2	5.8

CHAP. II TAB. 5

GEOGRAPHICAL DISTRIBUTION OF POVERTY AMONG FAMILIES

CRITERIA: Percentage of preschool children moderately and severally under-weight for age by region: Philippine 1987.

Western Visayas	23.3%
Western Mindanao	21.4%
Central Mindanao	20.4%
Eastern Visayas	19.8%
Metro Manila	17.5%
Ilocos	17.5%
Central Luzon	16.9%
Cagayan Valley	16.7%
Central Visayas	16.7%
Bicol	16.6%
Northern Mindanao	14.4%
Southern Tagalog	13.9%

CHAPTER III

Market Size and Plant Capacity

CHAP. III MARKET SIZE AND PLANT CAPACITY

The Philippino food industry represents 36% of the manufacturing industry and is based on a developed structure for distribution such as supermarkets, retail groceries stores, sari sari, market stalls and drugstores.

Conserved food products requirements are supplemented by a] share of imported goods, mainly from USA.

Also in this case, the distribution system is well organized, as it is centered in Metro Manila, which distributes through the usual channels all over the country. In small villages or remote areas the distributor is very often the whole saler.

The Philippino policy is, of course, to limit imports and to reduce all payments in foreign currency. For this reason an extra fee of 5% on imported goods has been added.

The custom duties on imported goods are generally calculated as follows:

Taxable basis: FOB value + freight + insurance and packing

Import duty: 28% VAT: 10% of goods value
Extra fee 5% .

Therefore, almost 40% of the total price is paid for import duties, consequently increasing the selling price of the products.

For infant foods, the total CIF value of imported consumer goods for 1990 was of US$ 55.000.000 approximately, which covers the following food products

	COMMODITY CODE	1990
1. Preparation of Flour, Meal, Starch or Malt Extract used as Infant Food	040.80-49	
Quantity in Kgs		354,917
FOB value in US$, Total		417,876
CIF value in US$, Total		450,097
2. Prepared Foods obtained by the Swelling or Roasting of Cereal grains (e.g. puffed rice, corn flakes & similar products)	048.12-00	
Quantity in kgs		1,383,492
FOB value in US$, Total		1,700,849
CIF value in US$, Total		1,841,554
3. Hypoallergenic Soy Food	048.80-31	
Quantity in kgs		1,007,003
FOB value in US$, Total		2,727,283
CIF value in US$, Total		2,834,275

4.	Milk, in powder or granules	022.43-02	
	Quantity in kgs		16,270,648
	FOB value in US$, Total		42,429,917
	CIF value in US$, Total		44,202,516
5.	Other Food Preparations	098.09-29	
	Quantity in kgs		5,725,268
	FOB Value in US$, Total		4,252,390
	CIF value in US$, Total		4,920,800

From the volumes and the categories of imported infant food, it is clear that the internal demand is not fully satisfied by the local production of infant foods.

As a matter of fact, many of the imported items are to replace and substitute an ideal product that is not yet available, having the following characteristics:

- high nutritional value;
- lower retail price;
- easy preparation;
- large availability and distribution.

The availability, distribution and consumption of proper quality foods determine the nutritional status of people. The Philippines has a burgeoning population, which is increasing at a rate of 2.5-2.7 annually. The rate of increase as estimated, will bring the population to 80 millions by the year 20[illegible]

From the nutritional point of view, the average daily per capita intake of energy for the target population (children belonging to 0-6 years age group) is 1445 cal, which represents 63.3% of the recommended daily allowance (RDA).

Although this datum may indicate a sufficient level in terms of supply, it concerns only the affluent segment of the population. Since most of the sources of good quality proteins - such as meat, egg and fish - are expensive, only those belonging to higher income group, have access to these food products.

Under the present economic conditions it has been reported that 17.2% of children belonging to 0-6 years age group, are severely to moderately underweight, on account of an inadequate food intake.

It is evident, that the prevalence of malnutrition is higher among those with even lower income. There is consequently a need to rehabilitate this group by providing adequate nutritious food.

III.2 Market analysis by segment

As per considerations made in chapter II, we have identified two main segments of the market:
A) Pre-cooked weaning food
B) Infant shaped cereals.

A) Pre-cooked weaning food

Within this sector, the segment of the cereal based baby foods (instant powders) is limited to a market (1990)of 1000 tpa for a value of 91.000.000 P. However, the growth rate recorded for 1990 is 43.57%, which makes estimate that by 1995 the market will be of 3800 tpa for a value of 487.000.000 P.
The market is actually covered by Nestlé products for 95.6%, which is also the biggest local industrial producer (960 tpa). The remaining 4.0% is provided for by imported products (Milupa, Gerber, etc.) (tab. A)
We shall consider as the reference products Nestlé's, which records the highest sales volume (95.6%) and has an average retail price of approx 100 P/kg (tab. B). If comparing it with the other imported goods, the difference between sales volume (kg) and sales value, indicates a favourable proportion for the imported products, i.e. the imported baby foods are sold at a higher selling price, although it accounts only for 4.0% in 1990, on account of high customs duties. Therefore, also this market segment could be easily entered by locally manufactured products, nutritionally balanced and at a lower price.

The actual offer of precooked weaning foods is clearly insufficient to meet with the increasing demand, especially for low income groups. Under this regard, the Government has developed promotional programs for the use of precooked weaning foods, based on local raw materials and easy to prepare at home.(see Appendix III.)
Therefore, in order to determine the actual total demand, the following must be considered:

a) local production of cereal based baby foods;
b) consumption of substitutive items (powder milk, homogeneized foods, etc.)
c) consumption of "home made" products.

The reference market for products PWF1 and PWF2 will be made of:

1) acquisition of Nestle's market share (same quality/lower price due to minor production costs);
2) market growth (30% average rate/3800 t in 1995);
3) import substitution (same quality/lower price relevant to product PWF1);
4) acquisition of new consumers from the home made products and other infant foods segments, generally imported (powder milk, infant soy foods, infant meals preparations).

Still considering cereal based baby food, it is confirmed that all the major ingredients and raw materials are largely available on site either because locally produced (rice, corn, wheat, coconut oil, banana) or because imported (ex. powder milk).

These products are most popular in Greater Manila Area and Mindanao. The main retail volumes are given by supermarkets followed equally by groceries and sari sari stores.

Other opportunities

On account of a generally suffered malnutrition, the cereal based baby foods can integrate also the diet of the pregnant/lactating women and the elderly to improve their RDA of nutrients.

Particularly, these products suit well the elderly also on account of possible mastication and digestion problems.

Under this regard, the product is a precooked cereal based flour, (mainly rice) added with vegetables, meat, fish, etc. For its characteristics of long-shelf life, this product can be sold in bulks or bags (2,3,5 kg/piece); therefore, not requiring special packaging procedures, reducing distribution costs, this type of product may enjoy an extremely low selling price, and enter a wide segment of the food market.

A) Summary situation of the market of cereal based baby foods in the Philippines

MARKET SIZE:

1990	1.000.000 kg	91.000.000 P
forecast (1995)	3.760.000 kg	486.300.000 P

PRODUCTS ALREADY EXISTING ON THE MARKET AND MARKET SHARES:

Nestlé 95.6% (Cerelac/Ceresoy) 950 tons, locally produced

Golden Rice 0.4% 4 ton, locally produced

Milupa
Gerber 4.0% imported
Neolac
Paslum

Average price: 80 P/kg net selling price
100 P/kg retail price

Preferences:
Cerelac corn+powder milk + banana
Ceresoy soy+corn+powder milk

Geographical distribution: Manila 26.6%
Luzon 19.7%

Visayas 23.2%

Mindanao 30.6%

Distribution channels: supermarkets 34.1%
retail saler 18.9%
sari sari 22.1%
markets 16.8%
drugstores 8.6%

B) Infant shaped cereals

The analysis of this market segment supports the basic assumption of the project as to say to exploit the plant capacity at its best and include to gether with the production of precooked weaning foods, addressed to the infant population (up to 3 years old children), a range of products mainly for pre-school and school age children (from 3 years old upwards).
This product mix can, of course, satisfy the demand of nutritional food items addressed to a wider part of the population.

It is not easy to gather all data relevant to the many products belonging to this segment, also on account of the difficulty in positioning the products according to their organoleptic characteristics.
A first distinction can be made among 3 major groups of products:

- savoury snacks (cereal based expanded products, generally fried and/or flavoured)
- breakfast cereals (i.e. cereal flakes, rice crispies, etc.)
- shaped cereals (cereal based expanded products, generally toasted and coated with honey, sugar, cocoa, etc.)

Some of these products are, however, not easily classified. They can be called infant shaped cereals and be addressed to a specific target defined by the type of packaging, promotional action, etc; the very same products, based on the same formulation and very often with the same shape, can be as well sold as snacks and addressed to more adult consumers.

On account of these considerations, we deem it pointless to break down these data; therefore, we carried out our analysis on the basis of the market overall data.

The Philipine market for these products has been valued 20,000,000 US$, approximately.

For this specific project, this represents a very huge market, still with a high potential for new comers; on the other hand, the products here analyzed can enter competition also with imported goods, and satisfy one of the main goal of the project itself, i.e. to replace imports with equivalent locally produced food items.

As for infant shaped cereals (target population from 3 to 6 years pre-schoolers), the market records a dramatic increase as for imported products.

As a matter of fact, importation of these products has increased from 264.705 kg (1988) to 1.383.492 kg (1990) for a value of USD 1.841.554, of which 40% approx paid for import duties.

The actual market presents locally produced breakfast cereals (Jack and Jill by URC/BBB Edams/ Harbours) and imported products (Nestlé, Nabisco, Ralston, Purina, Quaker, Kellogg's).

It is worth noticing that the local products are less sophisticated, offer a narrow range, and are less expensive.

On the other hand, the range of imported products is not limited to the traditional corn flakes or rice crispies but include shaped cereals, sweet coated products, shredded and fruit filled wheats, and cocoa-added products, all of them clearly addressed to the infant population.

These products are made of raw materials easily available on site. Although it is recommended to consume them with milk to improve their nutritional value and are generally considered a breakfast food, they can also be considered as a snack, offering various consumption opportunities and, at the same time, a balanced nutritive content.

Other opportunities

A. Breakfast cereals

Within the segment of breakfast cereals the shaped breakfast cereals can also enter a wider segment, represented by school-age children from 6 to 10 years and be adoptd in full-time schools in the urban areas.

B. Cereal Bars

Also to be considered, at a second stage, the opportunity offered by these products if used as fillers of cereal bars. As a matter of fact, by the addition of few machines, the plant can produce a sweet "snack" bar made of shaped cereals mixed with honey, malt, and other binding agents, added with nuts, peanuts, cocoa, and, in case, coated with chocolate and similar products.

This type of products has a huge potential in such a market, addressed to a wide population (virtually, all the young population, and not only); the most interesting aspect is the introduction of these cereal bars, specifically formulated, in school feeding and educational programs, whenever it is necessary to divulge correct nutritional principles of alimentation and intervene and solve specific nutritional problems affecting the young population.

C. Snacks

As above mentioned, the shaped cereals produced by the plant object of this study, can also enter the snack market. The current size of the Philipino snack market is estimated to be 31.000.000 kg (1990) (Tab. C).
The historical and projected compounded growth rates for the different sub-categories are the following:

GROWTH RATES	1986-1990	1990-1995
Corn-Based	26%	9%
Flour-based	46%	30%
Potato-based	43%	6%
Others	26%	1%
TOTAL SNACKS	34%	20%

While the corn-based snack products have been dominating the market, it is projected that the flour-based products, by virtue their low-price positioning, will soon overtake the corn-based snacks. However, the higher-priced corn-based snack products continue to embark on aggressive marketing efforts to protect their market franchise.

The most popular brands are:
- Granny Goose
- Jack & Jill
- Nutri Snack

Supermarkets are the most important outlet (41%) followed by Sari-Sari stores (27%), Groceries (18%) and Market Stalls(15%). While Supermarkets accounts for the lion's share in GMA, the smaller outlet types contributes the major slice in volume in the provincial areas, particularly Luzon and Mindanao. Main consumers of snackfood are males/females 11-19 years old, belonging to the high socio-eco strata and urban residents

III.3 Export situation

For this specific project, export was not considered since the local demand is high and can easily absorb the total output of the plant. Furthermore, the main scope of the project is the solution of local malnutrition among the infant population, regarded as the marketing target of this analysis. From the economical point of view, the goal of improving the foreign exchange balance is achieved through import substitution.

Nevertheless, considering the high marketing potential of GMC, already present with its own distribution and production organization in other foreign countries, such as USA, it can be possibly made an hypothesis of allocating part of the production output, especially of high value added products (i.e. PWF1), for export. This can only better the excellent economic and financial results already indicated.

Apart from the target population, virtually pre-schoolers from 3 to 6 years, the infant shaped cereals can cover also the market segment, principally constituted by schoolers from 6 to 10 years and be adopted in full-time schools in the urban areas.

III.4 Conclusions and sales forecast

Considering the results of the market analysis, i.e the size of the market itself in terms of volumes, values and projected growth, the opportunities offered by:

1. new products of local manufacture, and high nutritional level, at a reasonable price;
2. import substitution
3. wide range of products and different positioning.

We deem that the total plant output can be sold and marketed.

In particular, this is further supported by what stated in point 1 above, as to say, the widening of the basis of the target population due to a product offering a high favourable ratio price/quality made available also to lower income groups.
To be noted that these considerations do not take into account the growth rate of population, which is particularly relevant in the Philippines (+ 2.5-2.7% p.a.)

Nevertheless, out of production organization reasons and caution, we foresee that sales will grow according to the following table:

Table - Production program - Considered scenario

		PRODUCT MIX (TONS/YEARS)				
YEAR	RATE	PWF1	PWF2	MSC	HPSC	TOT.
1-	33%	172	175	294	294	935
2-	66%	343	350	587	587	1867
3-	100%	520	530	890	890	2830

the production program foresees the achievement of full production capacity in 3 years (33-66-100%).

III.4 Plant capacity

The maximum plant capacity is around 3.200 tpa (500kg/hr x 23hr x 280d) of shaped cereals.
The flexibility of the equipment allows to make the best choice as for product mix, establishing the proportion between precooked weaning foods, and infant shaped cereals production.
Therefore, the plant gives the following outputs, in case of single-product dedicated production:

- precooked cereal flours 350 kg/hr (2254 tpa)
- precooked weaning foods 490 kg/hr (3155 tpa) (precooked flours + up to 40% of additional ingredients)
- infant shaped cereals/ snacks. 500 kg/hr (3200 tpa)

The above figures include plant efficiency rate (95%) and one hour per day for plant changing operations.

This is only an estimate example of other scenarios; as for product mix and production organization, changing the working shifts and varying the ratio within the product mix, many alternatives are possible and viable.

Although the sales forecast are quite positive, it has been considered a possible shortfall in demand.

The same plant, as indicated in this chapter in the paragraphs entitled "Other opportunities" for each group of products, can produce, with minor operational modifications, the following alternative products:

- Milk based dessert dry mixes
- Instant fruit dry mixes
- Cereal based foods for the elderly
- Vitamin-added/fortified instant cereal based mixes for pregnant/lactating women.

Furthermore, by the addition of some finishing equipment, the plant can also produce the following alternative products:

- breakfast cereal flakes
- cereal based bars
- chocolate coated snacks
- fried savoury snacks
- laminated snacks (i.e. reformed potato chips, corn chips, tortilla chips)
- pasta goods (see appendix II)

The production requirements for these products have not been estimated as they fall outside the present terms of reference.

CHAPTER III

TABLES

CHAP. III TAB. A

BABY CEREALS MARKET DATA
1986 - 1995

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
	(ACT.)	(ACT.)	(ACT.)	(ACT.)	(ACT.)	(PROJ.)	(PROJ.)	(PROJ.)	(PROJ.)	(PROJ.)
TOTAL MARKET										
Volume (MT)	267,160	570,119	569,663	710,370	1,020,092	1,428,128	1,927,973	2,506,365	3,132,956	3,759,548
Growth Rate		113.40%	-0.08%	24.70%	43.60%	40%	35%	30%	25%	20%
Value (P000)	19,227	43,511	45,034	57,283	90,965	136,447	197,849	276,988	373,934	486,114
Growth Rate		126.30%	3.50%	27.20%	58.80%	50%	45%	40%	35%	30%

	MARKET SHARES BY VOLUME					MARKET SHARES BY VALUE				
	1986	1987	1988	1989	1990	1986	1987	1988	1989	1990
NESTLE	97.80%	95.60%	96.20%	98.10%	95.60%	97.00%	93.20%	93.90%	97.00%	89.60%
- CERELAC	95.50%	81.40%	81.90%	73.40%	62.60%	94.70%	81.20%	81.40%	74.40%	58.90%
- CERESOY	2.20%	14.20%	14.30%	24.70%	33.00%	2.30%	12.00%	12.50%	22.50%	30.70%
- NEWTREND	0.10%					0.60%				
OTHER BRANDS	2.20%	4.40%	3.80%	1.90%	4.40%	3.00%	6.80%	6.10%	3.00%	10.40%
NILUPA				0.40%	2.70%				1.20%	8.10%
GERBER					0.90%					1.50%
GOLDEN RICE	1.60%	1.30%	0.90%	0.40%	0.40%	2.10%	1.80%	1.20%	0.50%	0.50%
NEOLAC				0.70%	0.40%				0.70%	0.30%
PABLUM	0.60%	3.10%	2.90%	0.30%		0.90%	5.00%	4.90%	0.60%	

TYPICAL PRICE STRUCTURE
BABY CEREALS

	WHEAT BASE				SOYA BASE		
	CERELAC				CERESOY		
	Wheat 150gx6O	Banana 150gx6O	Wheat 350gx24	Wheat-Banana 350gx24	Rice 150gx6O	Rice-Banana 150gx4O	Rice-Spin & Squash 150gx4O
Suggested Retail Price with 10% VAT							
Per Piece	16.00	17.45	28.38	32.25	13.75	15.50	17.15
Per Kg	106.67	116.33	81.09	92.14	91.67	103.33	114.33
Per Case	960.00	1,047.00	681.12	774.00	825.00	620.00	686.00
10% Value-Added Taxes/Estimated Distribution Costs							
Per Piece	3.35	3.67	6.07	6.79	2.89	3.28	3.62
Per Kg	22.31	24.45	17.34	19.41	19.28	21.83	24.14
Per Case	200.80	220.09	145.63	163.86	173.53	131.01	144.89
Net Selling Price							
Per Piece	12.65	13.78	22.31	25.46	10.86	12.22	13.53
Per Kg	84.36	91.88	63.75	72.73	72.39	81.50	90.19
Per Case	759.20	826.91	535.49	610.94	651.47	488.99	541.11

Notes:

1. Cerelac (wheat base) and Ceresoy (soya base), which account for a total 95.6% of the infant cereal market are both Nestle brands.

2. Suggested Retail Prices are effective December, 1990

3. Estimated Distribution Costs include both retailer and distributor margins as well as freight expenses.

CHAP. III TAB. C

SNACKS MARKET DATA
1986 - 1995

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
	(ACT.)	(ACT.)	(ACT.)	(ACT.)	(ACT.)	(PROJ.)	(PROJ.)	(PROJ.)	(PROJ.)	(PROJ.)
TOTAL MARKET										
Volume (MT)	9,686,610	12,592,593	17,000,001	24,072,001	31,052,881	37,884,515	46,219,108	55,462,930	66,555,516	79,866,619
Growth Rate		30%	35%	42%	29%	22%	22%	20%	20%	20%
Value (P000)	133,292	171,947	228,689	320,165	409,811	520,460	660,984	826.230	1,032,787	1,290,984
Growth Rate		29%	33%	40%	28%	27%	27%	25%	25%	25%
CORN BASE										
Volume (MT)	5,250,143	6,825,186	9,214,001	13,047,025	13,307,966	14,106,444	15,234,959	16,606,106	18,266,716	20,093,388
Growth Rate		30%	35%	42%	2%	6%	8%	9%	10%	10%
Value (P000)	58,382	75,313	100,166	140,232	179,497	199,242	225,144	258,915	297,753	342,415
Growth Rate		29%	33%	40%	28%	11%	13%	15%	15%	15%
FLOUR BASE										
Volume (MT)	2,770,370	3,601,481	4,861,999	6,884,591	12,805,339	18,567,742	25,623,484	33,310,529	42,637,478	54,149,597
Growth Rate		30%	35%	42%	86%	45%	38%	30%	28%	27%
Value (P000)	50,918	65,684	87,360	122,304	156,549	237,955	345,034	469,247	628,791	836,291
Growth Rate		29%	33%	40%	28%	52%	45%	36%	34%	33%
POTATO BASE										
Volume (MT)	503,704	654,815	884,001	1,251,745	2,077,896	2,389,581	2,628,539	2,759,966	2,897,964	3,042,862
Growth Rate		30%	35%	42%	66%	15%	10%	5%	5%	5%
Value (P000)	10,930	14,100	18,753	26,254	33,605	40,662	46,761	51,437	56,581	62,239
Growth Rate		29%	33%	40%	28%	21%	15%	10%	10%	10%
OTHERS										
Volume (MT)	1,162,393	1,511,111	2,040,000	2,888,640	2,894,417	2,923,361	2,952,595	2,982,121	3,011,942	3,042,061
Growth Rate		30%	35%	42%	0%	1%	1%	1%	1%	1%
Value (P000)	13,063	16,851	22,412	31,377	40,163	42,572	45,127	47,834	50,704	53,747
Growth Rate		29%	33%	40%	28%	6%	6%	6%	6%	6%

CHAPTER III
ADDITIONAL TABLES

TYPICAL PRICE STRUCTURE
SNACKS

	CORN BASE		FLOUR BASE	
	30gx100	120gx50	40gx100	80gx50
Suggested Retail Price with VAT				
Per Piece	2.35	7.60	2.20	4.30
Per Kg	78.33	63.33	55.00	53.75
Per Case	235.00	380.00	220.00	215.00
10% Value-Added Tax/Estimated Distribution Costs				
Per Piece	0.68	1.99	0.66	1.29
Per Kg	22.81	16.56	16.50	16.13
Per Case	68.43	99.41	66.00	64.50
Net Selling Prices				
Per Piece	1.67	5.61	1.54	3.01
Per Kg	55.52	46.77	38.50	37.62
Per Case	166.57	280.59	154.00	150.50

Notes:

1. The corn base snack belong to the medium-price segment while the flour base snack belong to the low price segment.

2. Prices are effective as of September, 1990.

3. Estimated Distribution Costs include both retailer and distributor margins as well as freight expenses.

DETAILED PHIL. IMPORTATION STATISTICS - BY COMPANY
SNACK FOODS - 1989 TO 1990
(Source : Business Statistics Monitor)

Company	REMARK	Volume (In Ctns.) 1989	Volume (In Ctns.) 1990	Value (In US $) 1989	Value (In US $) 1990	Ave. Value/Ctn (In U S $) 1989	Ave. Value/Ctn (In U S $) 1990
Fortune Star Int'l. Sales Corp.	CY		1,270		4,445		3.500
Link Import Export Ent.	POE		4,950		7,868		1.589
	CY		15,400		40,820		2.651
Merrill Int'l. Trdg. Corp.	CY	2,700	7,650	10,395	26,793	3.850	3.502
Essential Sweets & Snacks, Inc.	POE		10,930		19,794		1.811
	CY		4,000		13,405		3.351
Magnitude Trading	CY		2,000		8,066		4.033
Million Merchandising	POE	3,250	3,942	12,350	14,640	3.800	3.714
Forward Trade Mktg.	CY	6,000	400	23,785	1,400	3.964	3.500
Regal Express Brokerage	POE	2,100	1,260	3,404	2,923	1.621	2.204
	CY		1,120		3,071		2.742
Intergrain Agri Food Products	POE	1,200	10,100	3,325	27,375	2.771	2.710
E. P. Aquino Trading	CY		5,900		17,035		2.887
Salon G.A. Enterprise	CY	375	4,950	2,180	15,985	5.813	3.229
A. Yung Chingco	CY	1,840	1,320	5,895	4,445	3.204	3.367
	POE	200		700		3.500	
Maria Lisa Mktg.	CY		800		3,489		4.361
Go Tec Just Trdg. Inc.	CY	3,800	3,400	16,168	14,824	4.255	4.360
	POE	1200		1,644		1.370	
Eterno Ent. Inc.	POE		1,408		2,989		2.123
Benby Ent. Inc.	CY		870		2,819		3.240
Multi Comm. Ent.	CY		10,200		31,616		3.076
Revrivale Ent.	CY		1,900		7,685		4.045
River Murray Ent.	CY		4,900		22,656		4.624
Duel Food Ent.	CY	5,725	3,750	16,418	12,375	2.868	3.300
Wha En Trading	CY		800		1,380		1.725
K. G. K. Food Prod.	CY		1,870		8,164		4.366
Tee Hing Trdg. Co.	CY		2,800		13,248		4.600
Miltrade Ent.	CY	420	3,000	1,176	9,150	2.800	3.050
	POE	680		1,774		2.609	
Liberty Gold Fruit Mktg.	CY		750		2,250		3.000
Three Young Master IM/EX	CY	5,700		15,675		2.750	
Long Distance Trdg. Corp.	CY	300		1,230		4.100	
Molina & Sons (Phils.)	CY	50		135		2.700	
Green Sweet Mdse.	CY	7,700		25,256		3.280	
Top Grade Mktg.	CY	300		1,050		3.500	
E. T. Allejo Trdg.	CY	2,300		6,375		2.772	
Bebison Int'l. Ent.	CY	800		2,640		3.300	
Conrad & Co., Inc.	CY	1,330		9,323		7.009	
Angelica Gen.Mdsg.	POE	600		822		1.370	
Portmaster Int'l. Sales	CY	700		3,199		4.570	
Infinitum Mdsng. Corp.	POE	1,700		8,928		5.251	
TOTAL		50,970	111,820	173,846	340,700	3.411	3.047

DETAILED PHIL. IMPORTATION STATISTICS - BY COMPANY
INFANT MILK - 1989 TO 1990
(Source : Business Statistics Monitor)

	1989	1990
A. VOLUME OF IMPORTATIONS (IN KGS.)		
Nestle Phil., Inc.	269,683	3,670,802
Abbott Lab. Phils., Inc.	365,222	1,831,432
Mead Johnson Phils., Inc.	125,597	851,117
Wyeth Suaco Lab., Inc.		139,440
Catholic Relief Services		2,826,742
Cycle Enterprises, Inc.		56,000
P & T General Mdg.	16,000	
Smith Kline & French O' Seas	1,219	
TOTAL	777,721	8,571,534
B. VALUE OF IMPORTATIONS (IN CIF US$)		
Nestle Phil., Inc.	786,148	10,153,299
Abbott Lab. Phils., Inc.	1,550,152	3,953,887
Mead Johnson Phils., Inc.	391,506	2,510,370
Wyeth Suaco Lab., Inc.		389,037
Catholic Relief Services		1,156,835
Cycle Enterprises, Inc.		29,592
P & T General Mdg.	5,362	
Smith Kline & French O' Seas	6,674	
TOTAL	2,747,842	18,193,020
C. AVE. VALUE OF IMPORTATIONS (IN CIF US$/KG.)		
Nestle Phil., Inc.	2.915	2.766
Abbott Lab. Phils., Inc.	4.266	3.833
Mead Johnson Phils., Inc.	3.117	2.950
Wyeth Suaco Lab., Inc.		2.750
Catholic Relief Services		0.410
Cycle Enterprises, Inc.		0.548
P & T General Mdg.	0.335	
Smith Kline & French O' Seas	5.475	
AVE. TOTAL	3.533	2.122

DETAILED PHIL. IMPORTATION STATISTICS - BY COMPANY
INFANT CEREALS - 1989 to 1990
(Source : Business Statistics Monitor)

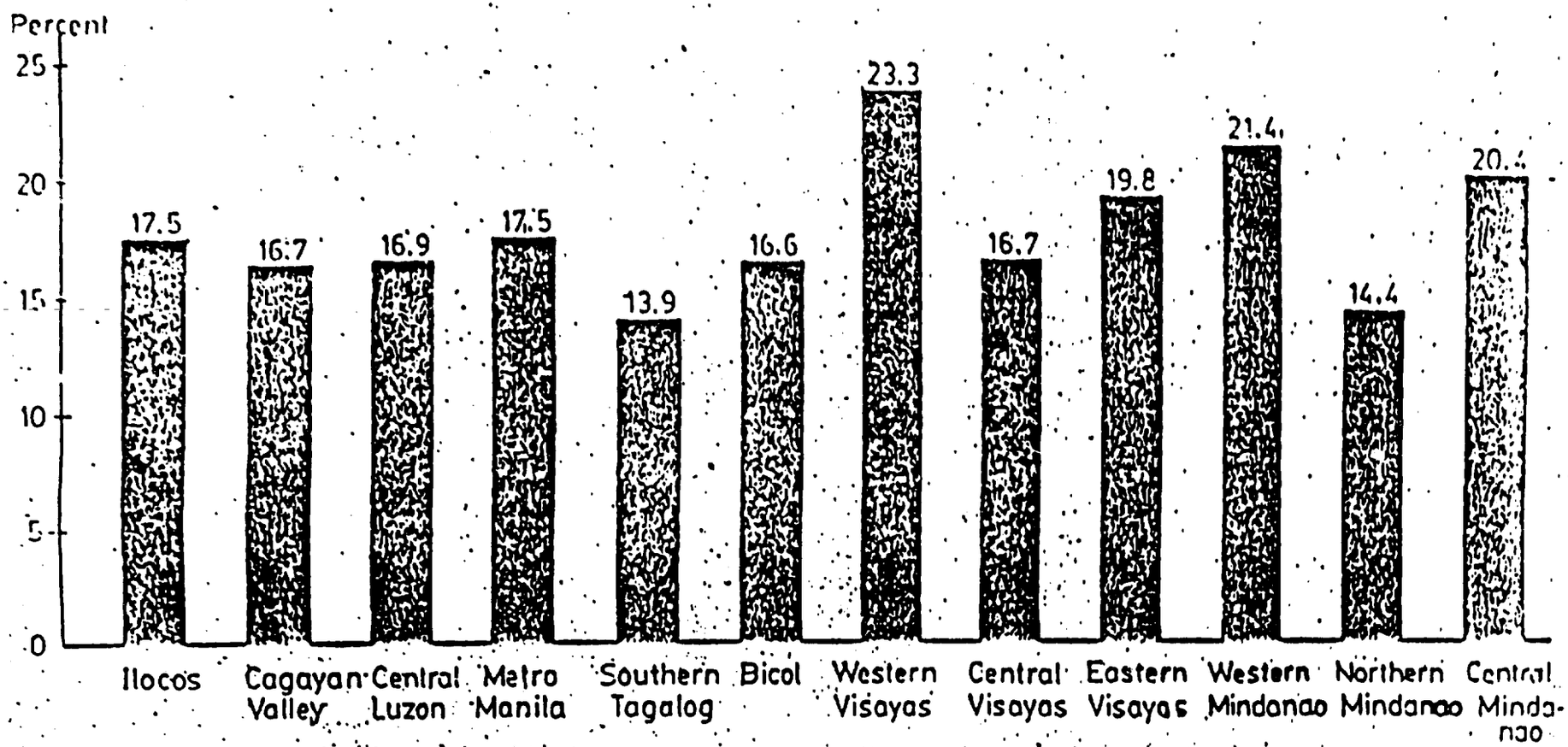
	1989	1990
A. VOLUME OF IMPORTATIONS (IN CASES 1/)		
Alliance Dairy Distributors 2/	6,000	6,500
International Supermarket 3/	3,450	
TOTAL	9,450	6,500
B. VALUE OF IMPORTATIONS (IN C&F US$)		
Alliance Dairy Distributors	105,146	150,588
International Supermarket	21,112	
TOTAL	126,258	150,588
C. AVE. VALUE OF IMPORTATIONS (IN C&F US$/KG.)		
Alliance Dairy Distributors	17.524	23.167
International Supermarket	6.119	
AVE. TOTAL	13.361	23.167

1/ Case sizes are not identical.
2/ Assorted "Milupa" mixed fruit, vegetable and rice baby cereal.
3/ Assorted "Heinz" baby food cereals

INFANT MILK BRANDS IMPORTED BY COMPANY

(Source : Business Statistics Monitor)

NAME OF COMPANY	BRAND NAME
1. NESTLE PHILS., INC.	a. Lactogen b. Nan c. Neslac d. Pelargon e. Pre-Nan
2. ABBOTT LAB. PHILS. INC.	a. Ensure b. Gain c. Ganna d. Isomil e. Similac
3. MEAD JOHNSON PHILS. INC.	a. Enfalac b. Isocal c. Nutramigen d. Pregistimil e. Prosobee
4. WYETH SUACO LAB. INC.	a. Promil
5. CATHOLIC RELIEF SERVICES	a. Corn-Soy Blend
6. CYCLE ENTERPRISES	a. Protilac
7. P & T GENERAL MSDG.	a. Denkalac
8. SMITH KLINE & FRENCH	a. Ensure



Percentage of preschool children moderately and severely underweight-for-age by region : Philippines, 1987

Comparison of mean one-day per capita food consumption: Philippines, 1978, 1982 and 1987

Food Group/Subgroup	1978	1982	1987	Percent Increase/ (Decrease) from 1982 to 1987
	Food Consumption, g/day (As Purchased Form)			
Cereals and Cereal Products	367	356	345	(3.1)*
Rice and Products	308	304	303	(0.3)
Corn and Products	38	34	24	(29.4)*
Cereal Products	21	18	18	-
Starchy Roots and Tubers	37	42	22	(47.6)*
Sugars and Syrups	19	22	24	9.1 *
Fats and Oils	13	14	14	-
Fish, Meat and Poultry	133	154	157	1.9
Fish and Products	102	113	111	(1.8)
Meat and Products	23	32	37	15.6 *
Poultry	7	10	9	(10.0)
Eggs	8	9	10	11.1
Milk and Milk Products	42	44	43	(2.3)
Whole Milk	31	30	36	20.0 *
Milk Products	11	14	7	(50.0)*
Dried Beans, Nuts and Seeds	8	10	10	-
Vegetables	145	130	111	(14.6)*
Green Leafy and Yellow	34	37	29	(21.6)*
Other Vegetables	111	93	82	(11.8)*
Fruits	104	102	107	4.9
Vitamin C-Rich Fruits	30	18	24	33.3 *
Other Fruits	74	84	83	(1.2)
Miscellaneous	21	32	26	(18.7)*
Beverages	8	16	12	(25.0)*
Condiments and Others	12	15	14	(6.7)

*Statistically significant

Mean one-day per capita food consumption: Philippines, by urbanization, 1987

Food Group/Subgroup	Philippines	Urban	Rural
	Food Consumption (grams, As Purchased Form)		
Cereals and Cereal Products	345	318	361
Rice and Products	303	281	317
Corn and Products	24	11	31
Cereal Products	18	26	13
Starchy Roots and Tubers	22	17	25
Sugars and Syrups	24	26	22
Fats and Oils	14	15	12
Fish, Meat and Poultry	157	174	145
Fish and Products	111	112	109
Meat and Products	37	52	28
Poultry	9	11	8
Eggs	10	13	8
Milk and Milk Products	43	56	34
Whole Milk	36	45	30
Milk Products	7	11	4
Dried Beans, Nuts and Seeds	10	11	9
Vegetables	111	105	115
Green Leafy and Yellow	29	25	32
Other Vegetables	82	80	83
Fruits	107	110	105
Vitamin C-Rich Fruits	24	30	20
Other Fruits	83	80	85
Miscellaneous	26	24	27
Beverages	12	10	13
Condiments and Others	14	14	14

Age when supplementary food was initially given among less than 3 year old Filipino children by region: Philippines, 1989-90

Region	Total Subjects	Start of Supplementary Feeding (Age in Months)								None Given
		Average Age	1	2	3	4	5	6	7 and over	
		Cumulative Percentage Distribution								Per Cent
PHILIPPINES	3393	5.0	1.1	3.3	18.3	42.0	58.9	77.1	91.0	9.0
National Capital Region	446	4.9	0	1.4	18.7	48.0	63.1	77.6	88.9	11.1
Areas Outside NCR										
I. Ilocos	324	5.3	0	0.6	9.9	30.0	49.1	75.0	87.3	12.7
II. Cagayan Valley	252	5.3	0.4	3.1	16.2	30.5	54.3	71.0	89.0	10.0
III. Central Luzon	270	5.3	0	0.4	13.7	38.2	53.7	71.9	91.9	8.1
IV. Southern Tagalog	351	4.4	0	2.7	27.7	48.7	62.0	76.5	90.4	9.6
V. Bicol	275	5.2	0.4	3.3	17.9	43.1	59.6	74.2	92.1	7.9
VI. Western Visayas	233	5.3	0.2	1.5	13.6	30.9	49.9	80.8	90.7	9.3
VII. Central Visayas	132	4.7	0.7	3.8	22.6	51.3	69.7	82.8	92.6	7.4
VIII. Eastern Visayas	228	5.3	3.1	6.6	19.0	40.0	51.5	66.5	88.5	11.5
IX. Western Mindanao	210	4.2	5.7	11.4	33.3	55.6	73.7	88.9	93.1	6.9
X. Northern Mindanao	274	4.7	1.9	4.5	27.9	48.6	62.7	76.4	89.1	10.9
XI. Southern Mindanao	221	5.0	0	1.5	15.8	38.2	55.1	77.5	92.5	7.5
XII. Central Mindanao	177	5.2	1.1	4.5	14.1	39.8	57.6	72.9	92.4	7.6

Percentage distribution of Filipino children by current milk feeding practice by age by region: Philippines, 1989-90

Region	Total Subjects	Purely Breastfeeding					Mixed Feeding					Purely Bottlefeeding				
		< 7	7-12	13-18	19-23	24 & above	< 7	7-12	13-18	19-23	24 & above	< 7	7-12	13-18	19-23	24 & above
PHILIPPINES	2331	12.8	12.5	9.5	3.8	4.5	6.6	4.0	3.7	1.6	1.3	6.1	8.4	10.0	5.0	12.0
National Capital Region	301	8.0	4.3	5.3	1.3	1.7	3.7	2.0	2.3	0.7	0.7	13.6	19.0	14.3	8.3	23.9
Areas Outside NCR																
I. Ilocos	245	11.5	11.5	11.3	5.7	4.2	6.6	4.2	1.7	1.4	0.0	2.5	8.3	11.0	2.9	14.4
II. Cagayan Valley	131	15.7	19.0	13.4	4.6	4.1	0.3	1.9	3.0	0.5	0.2	3.2	3.1	6.4	5.4	9.6
III. Central Luzon	178	11.4	15.2	13.9	2.2	2.7	6.5	5.2	3.3	-	-	4.4	6.9	10.8	3.6	14.7
IV. Southern Tagalog	320	12.2	9.7	5.9	2.1	4.4	6.4	4.4	1.7	1.0	1.4	6.0	6.7	10.8	7.6	17.0
V. Bicol	102	15.5	10.6	11.3	2.8	5.7	3.0	4.1	2.1	1.5	-	1.0	8.8	8.9	6.8	17.0
VI. Western Visayas	166	8.3	5.0	9.0	6.3	9.4	11.1	4.1	4.3	0.6	-	8.0	4.4	10.1	3.2	16.2
VII. Central Visayas	85	8.7	15.9	10.7	2.4	2.3	11.3	5.5	8.5	6.9	5.2	0.7	5.4	7.8	2.8	5.9
VIII. Eastern Visayas	144	17.3	13.9	9.6	2.6	10.0	2.7	3.5	2.0	-	2.0	2.9	9.6	11.3	4.5	8.2
IX. Western Mindanao	152	13.2	11.3	6.2	3.1	6.6	2.9	1.6	4.4	1.0	1.0	9.4	9.3	11.2	9.0	8.9
X. Northern Mindanao	179	12.4	13.0	6.1	3.0	2.0	5.0	1.3	0.3	-	1.6	8.7	10.4	12.2	7.2	18.0
XI. Southern Mindanao	132	15.4	14.0	10.4	2.1	1.2	5.0	4.4	3.1	1.7	-	5.3	15.5	8.3	6.2	7.3
XII. Central Mindanao	107	13.6	21.6	5.7	2.2	4.4	3.0	7.5	2.2	-	1.9	1.8	13.0	8.5	2.5	11.3

Nutrient	Intake	RDA	Percent Adequacy
Energy (Kcal)	914	1445	63.3
Protein (g)	29.5	28.6	103.1
Iron (mg)	6.1	7.0	87.1
Calcium (g)	0.29	0.50	58.0
Retinol Equivalent (mcg)	254	284	89.4
Thiamin (mg)	0.41	0.73	56.2
Riboflavin (mg)	0.42	0.73	57.5
Niacin (mg)	9.0	9.8	91.8
Ascorbic Acid (mg)	28.9	39.3	73.5

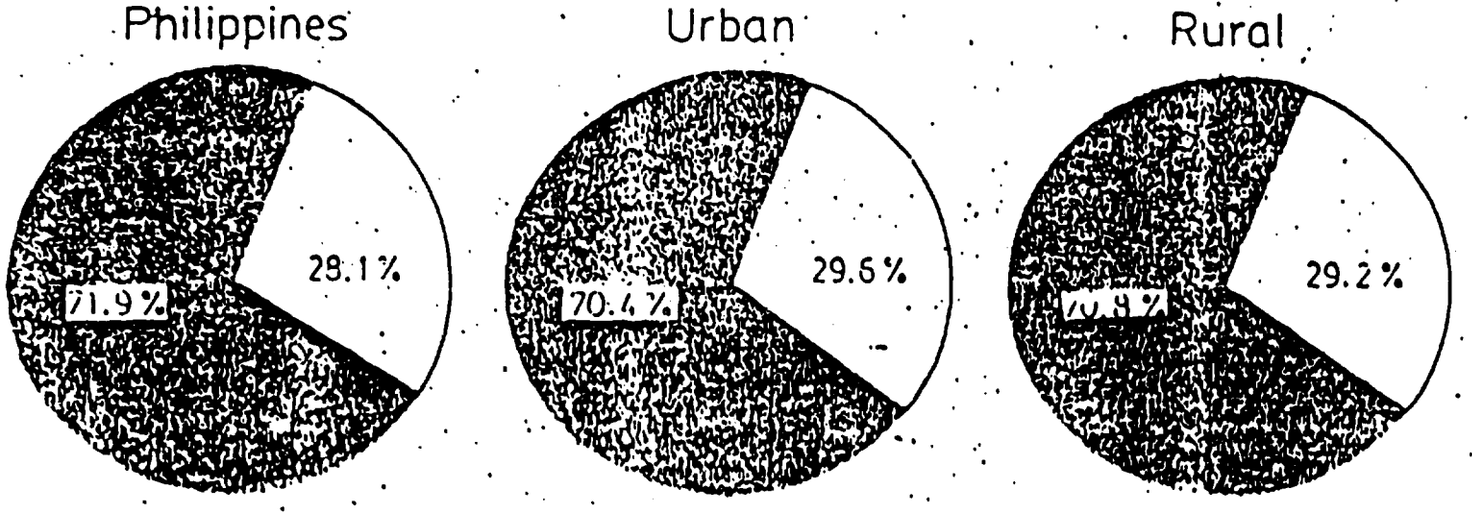
Mean one-day per capita nutrient intake, recommended dietary allowances (RDA) and percent adequacy among 6 month to 6 year old children : Philippines, 1987

Projected Populations, Philippines and Its Sub-Divisions, 1985-2020

Year	Philippines	Urban	Metropolitan Manila	Other Urban	Rural
1980 (Actual)	48,321,075	18,023,761	5,962,159	12,061,602	30,297,314
1985	55,693,406	22,232,808	7,104,791	15,128,017	33,460,598
1990	64,052,845	27,344,160	8,393,550	18,950,610	36,708,685
1995	73,084,408	33,224,172	9,671,569	23,552,603	39,860,236
2000	82,165,780	39,612,123	10,877,583	28,734,540	42,553,657
2005	90,829,286	46,204,858	12,009,510	34,195,348	44,624,428
2010	99,212,194	53,048,814	13,097,466	39,951,348	46,163,480
2015	106,925,654	59,846,289	14,275,355	45,570,934	47,079,365
2020	113,811,739	66,431,912	15,435,332	50,996,530	47,379,827

Projected Annual Rates of Growth

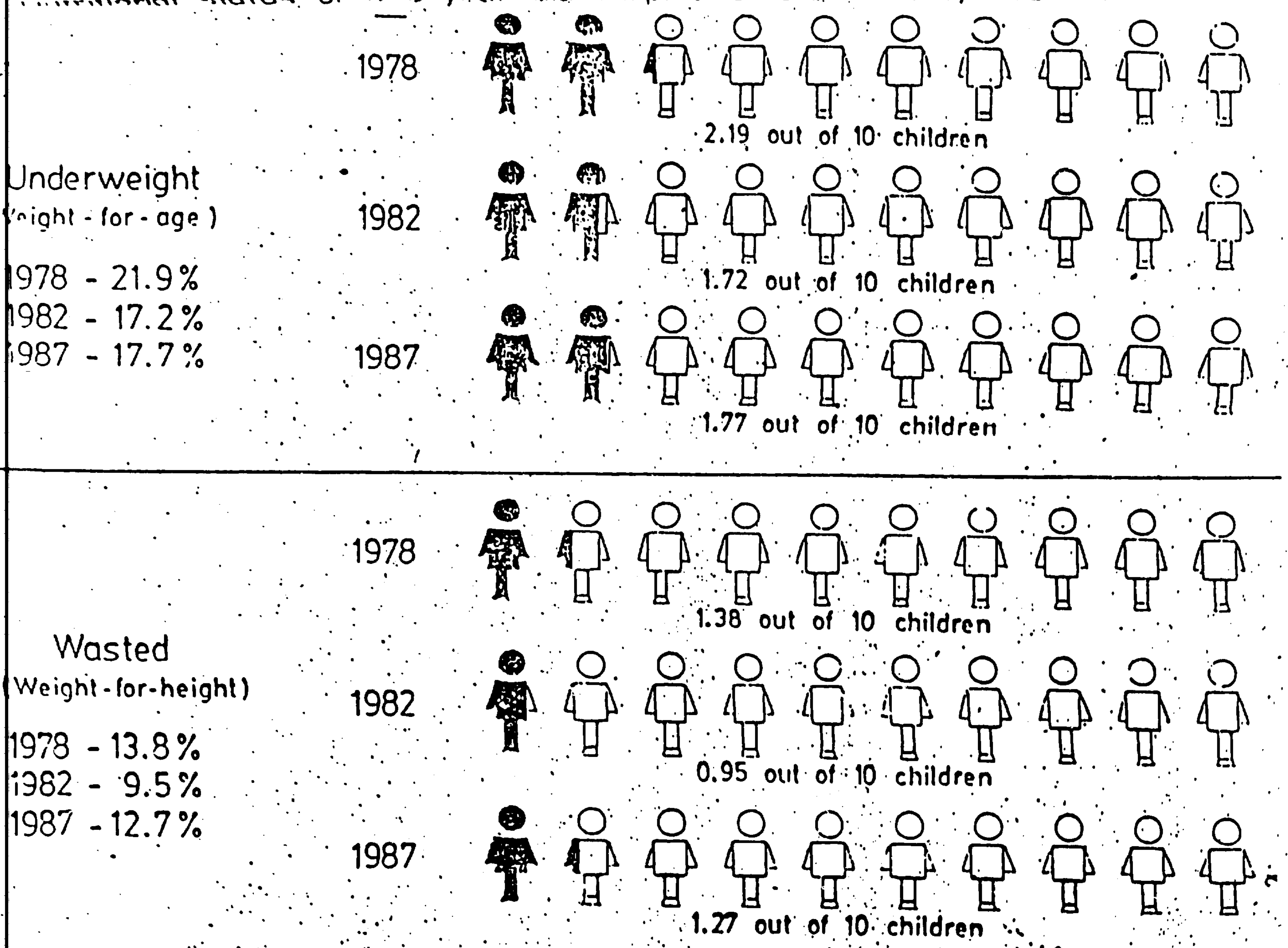
Year	Philippines	Urban	Metropolitan Manila	Other Urban	Rural
1980-1985	2.88	4.29	3.57	4.63	2.01
1985-1990	2.84	4.23	3.39	4.61	1.87
1990-1995	2.67	3.97	2.88	4.44	1.66
1995-2000	2.37	3.58	2.38	4.06	1.32
2000-2005	2.03	3.13	2.00	3.54	0.95
2005-2010	1.78	2.80	1.75	3.16	0.68
2010-2015	1.51	2.44	1.74	2.67	0.39
2015-2020	0.16	2.11	1.58	2.28	0.13



	Philippines	Urban	Rural
Food threshold, 1987	₱ 11.66	₱ 13.47	₱ 10.14
Inflated, 1989	₱ 14.02	₱ 16.20	₱ 12,20

One-day per capita food threshold and households meeting and below the food threshold : Philippines, by urbanization

... Year old Filipino children : 1978, 1982 and 1987



LANDMARK SUPERMARKET

BRAND	PRODUCT TYPE	WEIGHT	PRICE
JACK AND JILL	Chocolate Corn Flakes	250 g	26.95
	Frosted Flakes	250 g	26.95
	Chocolate Flakes	250 g	26.95
	Corn Flakes	250 g	35.90
NESTLE'	Honey Stars	20 g	
	Coco Crunch	20 g	
	King Rice	20 g	72.50
	Corn Flakes	20 g	
	Sporty's	25 g	
	Goldies	25 g	
	Rice Plus	120 g	32.95
	Honey Stars	150 g	38.45
	Nestle Trios	190 g	48.25
	Brown Rice Wheat/ Coco Crunch	170 g	38.45
	Corn Flakes	300 g	54.35
	Crisp Crunch (extra)	453 g	93.40
	Puff Wheat	170 g	86.10
NABISCO	Fruit Wheat	439 g	83.90
	Cream of Wheat	794 g	83.95
	Low Salt Wheat Thins	283 g	62.95
	Nutty Wheat	255 g	12.95
RALSTON	Corn Chex	496 g	no price
	Crisp Crunch	453 g	92.40
	Rice Chex		134.50
GOURMAND	Choco Corns	200 g	28.80
	Choco Puffs	325 g	35.75
	Big Cheese Corn Puffs	34 g	7.25
	Bacon Puffs	34 g	7.25
QUACKER OATS	Squares	453 g	99.75
	Quacker Puffs	198 g	90.85
	Honey Graham O's	340 g	109.70
	Cereal	100 g	93.50
KELLOGS	Smart Start	12 oz	110.25
	Fruit Wheats Raspberry	439 g	83.95
	Fruit Loops	350 g	112.95
	Honey Tops	350 g x 2	108.95
	Happy O's	120 g	29.80
	Corn Meals	20 oz	42.85

CHAPTER IV

Raw Materials and Inputs

CHAP. IV RAW MATERIALS AND INPUTS

IV.1 Introduction

Before considering specific raw materials it is important to understand the general principles underlying the composition and physical properties of infant foods, i.e. cereal based baby foods and infant shaped cereals.

IV.1.1 Weaning food

Weaning foods addressed to babies from 5/6 months to 3 years in general, should consist of a balanced mixture of the following components:

Staple food (high starch content)
Protein-rich food
Energy-rich food (high fat content)
Vitamin and Mineral-rich food
Flavourings

IV.1.2 Infant shaped cereals

Infant shaped cereals, addressed to pre-school children from 3 to 6 years, should consist of a balanced mixture of:

- staple food
- protein food

These types of breakfast cereals represent a second phase of the alimentation, replacing the powder baby foods with a more solid food.

Usually, these cereals are consumed with milk, which further improves their nutrient content to the daily diet.
As a Filipino producer advertizes:" (these products) are excellent sources for energy giving carbohydrates, essential vitamins and iron. Milk is a good source of protein and other essential vitamins and minerals.
Together, they complement each other to provide you the best supplement in good breakfast nutrition."

In terms of domestically available foods in the Philippines the ones listed below are the most important ones. Their suitability was established as a result of field work in the Philippines and this and many other aspects of babyfoods and their manufacture are recorded in site reports.

Staple Foods:

Rice
Maize
Wheat
---
cassava

Protein Foods

Plant sources:	Animal sources:
	Skimmed milk
Mung beans	Full fat milk
---	---
Soybeans	Meat, eggs, fish, sea foods

Energy foods:

Vegetable oils	Animal sources
Coconut oil	Full fat milk
---	---
Corn oil	Butter

Vitamin and mineral foods:

Vegetables:	Fruit:
Tomato	Orange
Onion	Guava
Cabbage	Papaya
Carrot	Banana
	Strawberry
	(limited)

Flavourings

Fruits and Vegetables (listed above)
Vanilla
Sugar (cane sugar, corn syrup)

IV.2 Utilizable domestic raw materials

The above list covers all materials which are suitable for the preparation of baby food at home. For manufactured baby food there are restrictions on the materials which can be used due to a number of factors including the following:

- insufficient quantities available either in the raw or semi-processed form;
- poor general acceptability in terms of colour, content, texture , flavour;
- high perishability of food of high water content, which applies to all fruits and vegetables.

The materials in each group are now considered in more detail:

IV.2.1 Staples

The flours are available in large quantities. Protein content and quality is reasonably good for wheat but poorer in maize and rice. However, it is enough to combine these cereals with protein foods (e.g. soybeans) to improve the protein quality, due to the restoration of the amino acid balance. Wheat, rice and maize are of acceptable colour provided the extraction rate is low enough. Wheat and rice have proven to be acceptable with wheat having the best quality image.

Maize is less preferred as a food except in the southern provinces but it should nevertheless be satisfactory as a component of the food products as considered by this study. All are free of anti-nutritional factors.

IV.2.2 Protein Foods

The most suitable high protein foods are those above the dividing line in the list above, mung beans and milk, both skimmed and full-fat. Supplies are generally well established. All are acceptable foods and currently used in products.

The other high protein foods are commented on as follows:

- Soybeans are not yet available in sufficient quantities. In the shorter term, imported defatted soy flour may be an economic proposition.

IV.2.3 Energy Foods

The most suitable high calories foods are fats and oils.
Full fat milk powder is a dual purpose food in that it has a high fat content in addition to good quality protein.
Other vegetable oils could be substituted provided they do not develop rancidity during the shelf life of the final product. Blends of cheaper oils may allow a lower cost product to be manufactured. Butterfat or butter would be too costly and has no particular nutritional or functional benefits over vegetable oils.

IV.2.4 Fruits and vegetables

It is considered that all fruits and vegetables are less suitable for the types of babyfoods envisaged since they are highly perishable and seasonal in supply. They are more particularly suited to wet babyfoods of the multi-component "complete meal" type.

The nutritional importance of fruit and vegetables is solely in supplying vitamins and minerals as far as infant feeding is concerned. These can be added in controlled amounts to allow for losses during processing.

The high fibre content of fruits and vegetables is undesirable in the application for infants foods.

The flavouring aspects of fruits and vegetables are considered below.

IV.2.5 Flavourings

Sugar can be considered as the main flavouring and sweeting agent which, in addition, provides calories much as starch but without bulk which starch provides due to its high viscosity. Cane sugar is the most likely source although corn syrup may be available in the longer term.

Vanilla is a popular flavour and although vanillin grows wild in the highlands, the flavour is not extracted for commercial use.

Natural or artificial fruit and vegetable flavours could be incorporated in the products if required.

IV.2.6 Packaging materials

As for packaging the following should be considered.
Powder infant foods are either packed in tins or in bags within carton boxes.
Packaging in metal or in tin cans, colour-printed and bottom-sealed, with open-top plastic covers is always recommended in those countries where transport and distribution systems are not developed, which is not the case of the Philippines.
More generally, powder infant foods are packed in bags within boxes. The same type of packaging is widely used for shaped cereals.

Therefore, on account of economic considerations and rational composition of the production line and packaging equipment, the present study has considered packaging in multi-coloured carton boxes and thermosealable plastic bags for both types of products.

IV.3. Domestic raw materials production capability

The most economical production of the major raw materials is now considered and in particular the extent to which raw materials can be supplied domestically rather than importing from abroad.

The following general points can be made at the outset:

(i) In seasons of adequate rainfall there is ample supply of major raw materials covering both crops and animal products.

(ii) The wide range of climatic conditions and differences in altitude mean that a broad variety of crops can be grown and are to some extent interchangeable in the food formulations. This helps in controlling ingredients costs as well as adopting formulations to suit consumer preferences.

(iii) The basic requirements are for cereals, pulses and milk powders. Wheat, commodities and milk powders in particular are available worldwide.

IV.3.1 Annual requirements, characteristics and domestic availability of raw materials

Quantities of materials required relates directly to the product formulations which for the baby foods are provisionally in percentage terms as follows:

Ingredient	**PWF1**	**PWF2**
Rice Flour	65%	20%
maize or wheat, or mixes		40%
Skimmed milk powder	20%	
Defatted soy flour		25%
Vegetable Oil (coconut corn)		5%
Cane sugar	15%	10%
	---	---
	100%	100%

As far as infant shaped cereals, the following formulations are considered:

MULTICEREAL HIGH PROTEIN

wheat	40%
rice	58%
corn	30%
*DSF	30%
rice	17%
sugar	8%
cocoa	3%
sugar	8%
malt	2%
salt	2%

*DSF = defatted soy flour

Following exhaustive discussions with General Milling and other official bodies the availability of the necessary raw materials was analysed. From initial discussions it appeared that two product types should be considered with two formulations for each. Total quantities of each of the raw materials for the ultimate target output of 2830 tons (three-shifts working), divided into:

PFW1"	520 tons
PWF2"	530 tons
Multicereal shaped cereals	890 tons
High protein shaped cereals	890 tons

are as follows:

	tpa
Rice	1.250
Maize	640
Wheat	300
DSF	450
Sugar	295
Milk powder	104
Salt	40
Cocoa	30
Malt	20
Oil	30
	------
tot.	**3160 tons/per year**

It is appreciated that further quantities will be required for the diverse range of products which are intended for the new plant. The materials required are considered briefly in the following sections.

Looking at the **domestic production** in the Philippines, for each of the above mentioned food groups, the following are available:

IV.3.1.1 Staple foods

Wheat, rice and maize shoud be obtained as flour of 81 percent and 80 percent extraction rate respectively. Being GMC a milling company, no problems are foreseen in the supply and availability of these foods.

Rice

The minimum quantity of rice required is 1.250 tpa. Rice is widely cultivated in the Philippines. In 1988, the volume of production for palay was 8.971 tons. Rice cultivation represents 16% of the total agriculture production.

Maize

The minimum quantity of corn flour required is 640 tpa. Maize is widely cultivated in the Philippines. In 1988, the volume of production for maize was 4.428 tons. Maize cultivation represents 7.9% of the total agriculture production.

Wheat

The minimum quantity of wheat flour required is 300 tpa. Wheat flour is currently produced by 8 milling companies which grind 1.100.000 tpa of the imported wheat.

Being this the situation, supply and provisions for the minimum required quantity should not be a problem.

Note: in the case of wheat flour, it must be pointed out that wheat is imported in the Philippines in large quantities under special import procedures that do not affect its final price.

IV.3.1.2 Protein foods

Soy and mung beans are not currently processed into flour at purpose-built plants.

Skimmed milk powder (SMP) is not produced in the Philippines. The Philippines importe 58,246 MT of Milk Powder with less than 1.5% fat in 1988.
The minimum requirement is 104 MT.

Defatted soy flour

The minimum quantity of defatted soy flour required is 450 tpa. Defatted soy flour is not actually produced in the Philippines. Soy-based products (i.e. hypoallergenic soy food) are currently imported.
As for legumes and pulses, soybeans are locally cultivated for a total production of 5.698 tons (1987).

IV.3.1.3 Energy Foods

Coconut and corn oils are significantly cheaper than imported oils. Again local processed raw materials should be used in the food formulations.

Full fat milk required to hydrate baby foods and/or to be consumed with breakfast cereals is generally available in the Philipino market.

IV.3.1.4 Vitamins, Minerals and Flavourings

Vitamins and minerals and most flavours would have to be imported; cane sugar is available domestically.

IV.3.1.5 Packaging materials

Based on the considerations as per point 2.6, the packaging materials required, i.e. carton boxes and plastic bags are generally available in the Philippines.

IV.4 Raw materials specifications

IV.4.1 Wheat flour

Appearance: white to cream in colour, fine, free-flowing, must be free from rodents, insects and other contaminants.

Specifications:

moisture	14.0% (max)
protein	9.0-10.5%
ash	1.0 % (max)
Amilogram	
Viscosity Peak (75/500g)	1000/1500 BU (700 cmg) at 87-89-C
Granularity	
retained in 300 microns sieve	0.2%
retained in 210 microns sieve	0.3%
retained in 150 microns sieve	20-25%
passed through 150 microns sieve	70-80%

- Microbiology: Spoilage and pathogenic organisms should be absent. Yeast and moulds less than 50/g.

- Mycotoxins: Absent.

IV.4.2 Rice flour

Appearance: whitish to cream colour, granular, free-flowing, clean, free from rodents, insects, and other extraneous material.

Specifications:

moisture	14.0%
fat	

1% max,

viscosity peak (45/500 g) 450-550 B.U.

at 93-C (700 cmg)

Granularity:

retained in 300 microns	sieve	0.5%
retained in 210 microns	sieve	4.5%
retained in 150 microns	sieve	35.0%
passed through 150 microns	sieve	60.0%

IV.4.3 Refined sugar

Description: a sugar obtained from sugar cane. Must be air-stable; colorless, white, free-flowing.

Appearance: must be free from rodents, insects, and other extraneous materials; must be free from hard lumps.

Flavour and odor: characteristic sweet flavour; odorless.

Specifications:

moisture (oven drying at 100-C)	0.5% max
purity	99%
particle size:	
passed through 800 sieve	100%

IV.4.4 Salt

White marine salt. Must be free flowing and air stable.

Flavour: characteristc salty without bitter aftertaste

Specifications:

moisture	0,5% max
% purity	99%

Particle size:

passed through 500 sieve 100%

IV.4.5 Non diastatic malt extract syrup

Dry refractometric residue	80% min.
ash	0.5% max
protein (Nx6,25)	2-4%
reducing sugar (maltose)	57% min.
pH of 10% solution	5,5-6%
saccharifying power (Pollack's Units)	Absent

IV.4.6 Corn flour

Moisture	15% max
protein	7,5-8,5%
fat	2,5% max
ash	1,5% max

Viscosity peak (55/500g) 550-650 Bu at 90-95-C (700 cmg)

Granularity

retained in 300	microns sieve	0-1%
retained in 210	microns sieve	3-5%
retained in 150	microns sieve	30-40%
passed through 150	microns sieve	60-70%

IV.4.7 Defatted soy Flour (DSF)

Colour	creamy white
taste and smell	neutral
Specifications:	
A - Chemical:	
moisture	8,0% max
protein content in dry basis (Nx6.25)	52,0% min
Fat (p.e. extract)	1,5% max
Ash	6,5% max
B - Microbiological	
total plate count	max 20.000/g
thermophilic aerobic spores	max. 1.000/10g
Coliform Organisms	max. 100/10g
Salmonella	negative/25g

IV.4.8 Skimmed milk powder

Taste and smell: typical of milk without rancidity and off flavour

Appearance: white to creamy colour powder free from any insect fragment or contamination

Specifications:	
moisture:	6% max
fat:	1,5% max
protein:	36% min
Microbiology	
Total plate count	3000/g
choliform	absent in 1g
salmonella	absent in 25g
yeast and moulds	less than 10g

IV.4.9 Cremcot SP or frytol (refined)

Appearance: yellow, plastic part, solid at room temperature; free from insects or insect fragments and other contaminants.

Specifications:

% FFA (as oleic)	0.05 % max
Slip point, - C	35.0-36.0
Melting point, - C	36.5-37.0
Smoke point, -C	235.0
Refractive index	1.448
Iodine value	47.0
Saporification value	204.0

IV.4.10 Corn oil

Appearance: clear, brilliant, liquid fat; must be free from rodents, insects and other contaminants.

Specifications:

FFA fresh	0.05% (max)
Iodine value	122-128
Peroxide value	0.5 meqs (max)
Saponification value	188-191
Viscosity (Soybolt universal at 38-C)	168-173 sec
Specific gravity at 16-C	0.924-0.926
Weight/gal at 16-C	3.5 kgs
Melting point	-11 °C
Smoke point	229-238
Flash point	332-338
Fire point	366-371
Colour (Lovibond)	4-0 R (max)

Flavour: bland, no biting taste, no rancid flavour.

IV.4.11 Coconut oil

Appearance: white, solid point; must be free from rodents, insects, and other contaminants.

Specifications:

Melting point	24-26- C
% FFA	0.027
Saponification valu	247.44
Peroxide value	0.44
Iodine number	6.18

IV.4.12 Cocoa powder

Description: powder obtained from the roasted cured Kernals of the ripe seed of theobroma cacao. It is made from a chocolate liquor which has been pressed by a hydraulic press until the desired fat content is reached and then pulverized.

Appearence: should be of characteristic brown colour, free from lumps and contaminants.

Odor and taste: should be characteristic and pleasant, free from stale, musty, scorched, astringent, acidic, burnt and other off-flavours and odors.

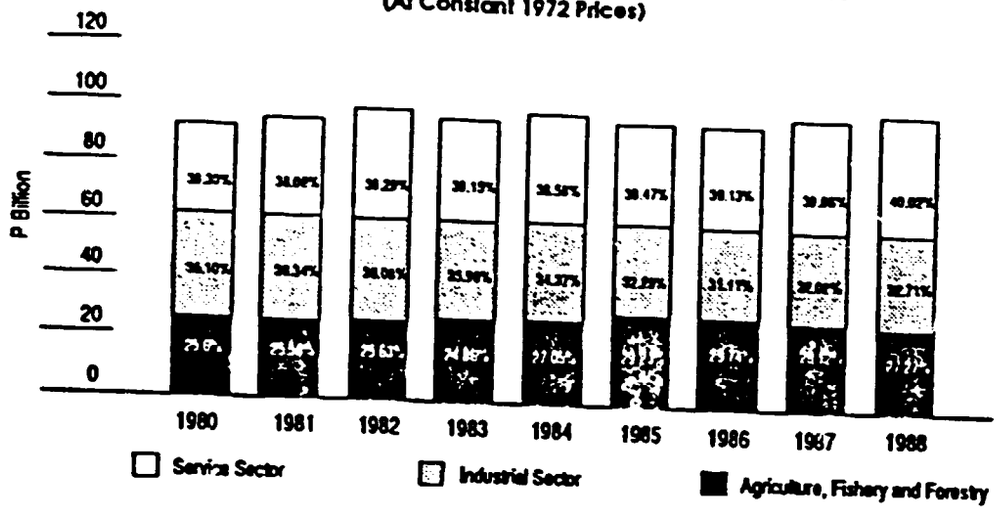
Specifications:

fat	10-14%
moisture	4.5%
pH	7.2 +/- 0.2
Shell	1.75% max
Particle size	97-98% passed through 200 microns sieve

Storage: cool dry place away from direct exposure to sunlight.

CHAPTER IV
ADDITIONAL TABLES

GRC NATIONAL PRODUCT BY SECTORAL ORIGIN: 1980 TO 1988
(At Constant 1972 Prices)



GROSS NATIONAL PPODUCT BY INDUSTRIAL ORIGIN: 1980 TO 1988
(In million pesos at constant prices)

INDUSTRY	1980	1981	1982	1983	1984	1985	1986	1987	1988
Agriculture, Fishery and Forestry	23,732	24,608	25,378	24,845	25,409	26,252	27,110	26,834	27,752
Industrial Sector	33,471	34,963	35,714	35,955	32,282	29,000	28,360	30,561	33,281
Service Sector	35,503	36,636	37,907	39,120	36,236	34,551	35,674	38,039	40,725
GROSS DOMESTIC PRODUCT at market prices	92,706	96,207	98,999	99,920	93,927	89,803	91,164	95,434	101,758
Net Factor Income from Abroad	(77)	(166)	(1,460)	(1,301)	(2,283)	(2,037)	(1,676)	(666)	(646)
GROSS NATIONAL PRODUCT at market prices	92,629	96,041	97,539	98,619	91,644	87,766	89,488	94,768	101,112

GROSS NATIONAL PRODUCT BY INDUSTRIAL ORIGIN: 1980 TO 1988
(In million pesos at current prices)

INDUSTRY	1980	1981	1982	1983	1984	1985	1986	1987	1988
Agriculture, Fishery and Forestry	61,757	69,391	76,721	84,546	139,505	162,519	156,989	170,770	189,606
Industrial Sector	98,162	111,613	122,571	138,179	136,154	200,544	202,280	229,683	269,938
Service Sector	106,089	124,270	141,293	161,370	214,807	246,396	266,160	305,013	362,295
GROSS DOMESTIC PRODUCT at market prices	266,008	305,274	340,585	384,095	540,466	609,459	624,429	705,466	821,839
Net Factor Income from Abroad	(930)	(1,630)	(5,162)	(5,350)	(1,311)	(14,941)	(12,426)	(5,007)	(5,740)
GROSS NATIONAL PRODUCT at market prices	265,078	303,644	335,423	378,745	527,356	594,518	612,003	700,459	816,095

Source: National Economic and Development Authority
Economic & Social Statistics Office
National Statistics Coordination Board

TABLE 1: VOLUME OF PROI TION IN AGRICULTURE, PHILIPPINES
JANUARY-DECEMBER 1986-1988
(IN 000' METRIC TONS)

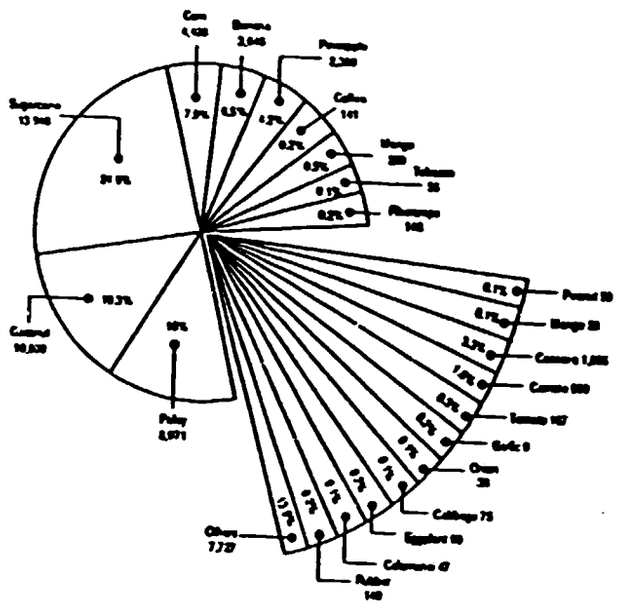
SECTOR	1986	1987	1988	Percent Change 1986-1987	Percent Change 1987-1988
AGRICUTURAL CROPS	57,162.00	54,730.00	55,905.00	(4.25)	2.15
Major Crops	46,522.00	44,054.00	44,760.00	(5.31)	1.62
Palay	9,247.00	8,540.00	8,971.00	(7.65)	5.05
Corn	4,091.00	4,278.00	4,428.00	4.57	3.51
Coconut	11,926.00	11,803.00	10,800.00	(1.03)	(8.50)
Sugarcane	14,603.00	12,664.00	13,940.00	(13.75)	10.08
Banana	3,832.00	3,780.00	3,645.00	(1.36)	(3.57)
Pineapple	2,066.00	2,302.00	2,350.00	1,142.00	2.09
Coffee	140.00	132.00	141.00	(5.71)	6.82
Mango	301.00	347.00	289.00	15.28	(16.71)
Tobacco	57.00	58.00	56.00	1.75	(3.45)
Fibercrops	179.00	150.00	108.00	(16.20)	(1.33)
Other Crops	10,640.00	10,678.00	11,137.00	0.34	4.32
Peanut	46.00	50.00	50.00	8.70	0.00
Mongo	26.00	27.00	28.00	3.85	3.70
Cassava	1,724.00	1,784.00	1,866.00	3.48	4.60
Camote	826.00	869.00	900.00	5.21	3.57
Tomato	149.00	154.00	167.00	3.36	8.44
Garlic	17.00	15.00	9.00	(11.76)	(40.00)
Onion	54.00	62.00	38.00	14.81	(38.71)
Cabbage	75.00	76.00	75.00	1.33	(1.32)
Eggplant	84.00	87.00	90.00	3.57	3.45
Calamansi	49.00	49.00	47.00	0.00	(4.08)
Rubber	135.00	134.00	140.00	(0.74)	4.48
Others	7,455.00	7,369.00	7,727.00	(1.15)	4.86
Livestock	978.80	1,080.47	1,179.81	10.39	9.19
Carabao	88.70	98.50	112.10	11.05	13.81
Cattle	151.30	161.40	154.20	6.68	(4.46)
Hog	692.00	768.38	857.80	11.04	11.64
Goat	44.30	49.62	53.12	12.01	7.05
Dairy	2.50	2.57	2.59	2.80	0.78
Poultry	560.13	577.95	645.55	3.18	11.70
Chicken	399.93	404.10	455.08	1.04	12.62
Duck	29.20	31.13	33.15	6.61	3.92
Chicken Egg	112.00	125.30	140.04	11.87	11.76
Duck Egg	19.00	17.42	18.08	(8.32)	3.79
Fishery	2,089.00	2,213.00	2,305.00	5.94	4.16
Commercial	546.00	591.00	606.00	8.24	3.05
Municipal	1,072.00	1,061.00	1,094.00	(1.03)	3.11
Aquaculture	471.00	561.00	602.00	19.11	7.31
TOTAL AGRICULTURE	60,790.00	58,601.00	60,035.00	(3.60)	2.45

TABLE 2. VALUE OF PRODUCTION IN A CULTURE
JANUARY-DECEMBER 1986-1988
(IN MILLION PESOS)

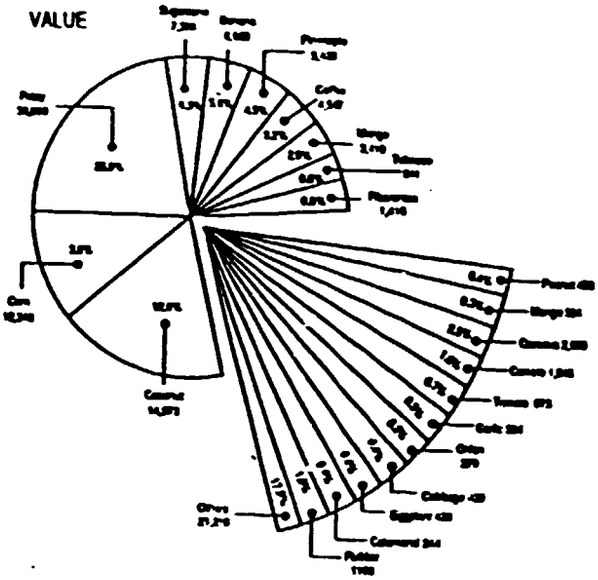
SECTOR	At Current Prices			Percent Change:		At Constant 1985 Prices :			Percent Change	
	1986	1987	1988	1986-1987	1987-1988	1986	1987	1988	1986-1987	1987-1988
AGRICULTURAL CROPS	99,030	105,569	119,304	6.60	13.01	108,031	105,909	107,003	(2.06)	1.13
Major Crops	73,889	78,649	68,827	6.44	12.94	80,085	77,771	78,219	(2.89)	0.58
Palay	26,076	26,122	30,860	0.18	18.14	29,868	27,584	28,976	(7.65)	5.03
Corn	10,431	12,177	13,063	16.74	7.28	11,455	11,979	12,348	4.57	5.05
Coconut	12,204	13,861	14,973	13.58	8.02	16,935	16,760	15,336	-1.03	(8.50)
Sugarcane	4,992	5,413	7,538	8.43	39.26	4,698	4,052	4,461	(13.75)	10.09
Banana	6,265	6,445	6,653	2.87	3.23	5,863	5,783	5,577	(1.36)	(3.56)
Pineapple	3,954	5,048	5,426	27.67	7.49	3,843	4,282	4,371	11.42	2.09
Coffee	4,598	3,723	4,547	(19.03)	22.13	3,363	3,171	3,386	(5.71)	6.78
Mango	3,010	3,416	3,410	13.49	(0.18)	2,062	2,377	1,980	15.28	(16.70)
Tobacco	859	1,008	941	17.35	(6.65)	861	876	846	1.74	(3.42)
Fibercrops	1,500	1,436	1,416	(4.27)	(1.39)	1,137	907	808	(20.23)	(2.09)
Other Crops	25,141	26,920	30,477	7.08	13.21	27,946	28,038	28,784	0.33	2.66
Peanut	469	466	453	3.79	(2.79)	396	430	430	8.59	0.00
Mongo	327	322	334	(1.53)	3.73	316	328	340	3.80	3.66
Cassava	2,243	2,529	2,690	12.75	6.37	2,276	2,355	2,463	3.47	4.59
Camote	1,577	1,553	1,948	(1.52)	25.43	1,545	1,625	1,683	5.18	3.57
Tomato	657	602	673	(8.37)	11.79	641	662	718	3.28	8.46
Garlic	692	511	384	(26.16)	(24.85)	664	586	356	(11.75)	(39.25)
Onion	542	417	279	(23.06)	(33.09)	558	641	393	14.87	(30.69)
Cabbage	438	424	429	(3.20)	1.18	389	394	389	1.29	(1.27)
Eggplant	423	391	428	(7.57)	9.46	394	408	422	3.55	3.43
Calamansi	250	365	442	25.86	21.10	254	254	244	0.00	(3.94)
Rubber	709	938	1,198	32.30	27.72	608	603	630	(0.82)	4.48
Others	16,794	10,402	21,219	9.57	15.31	19,905	19,752	20,716	(0.77)	4.48
Livestock	16,752	18,981	23,105	13.31	21.73	16,701	18,422	20,080	10.31	9.00
Caraboo	1,025	1,238	1,536	20.78	24.07	1,107	1,229	1,399	11.02	13.83
Cattle	2,642	3,287	3,768	24.41	14.63	2,858	3,049	2,913	6.68	(4.46)
Hog	12,664	13,969	17,250	10.30	23.49	12,338	13,700	15,294	11.04	11.64
Goat	408	474	538	16.18	13.50	385	431	461	11.95	6.96
Dairy	12.50	13	13	2.80	0.78	12.50	13	13	2.80	0.78
Poultry	16,237	18,121	20,325	11.81	12.16	15,718	16,257	18,142	3.43	11.60
Chicken	11,354	12,588	14,601	10.87	15.99	10,922	11,035	12,428	1.03	12.62
Duck	1,154	1,273	1,384	10.31	8.72	1,075	1,146	1,190	6.60	3.84
Chicken Egg	3,290	3,842	3,897	16.78	1.43	3,293	3,684	4,117	11.87	11.75
Duck Egg	409	418	443	2.20	5.98	428	392	407	(8.41)	3.83
Fishery	36,912	37,158	37,968	0.67	2.18	31,858	33,981	35,447	6.66	4.31
Commercial	9,248	9,817	9,446	6.15	(3.78)	8,376	9,066	9,342	8.24	3.04
Municipal	17,251	16,032	16,169	(7.07)	0.85	15,169	15,013	15,480	(1.03)	3.11
Aquaculture	10,413	11,309	12,353	8.60	9.23	8,313	9,902	10,625	19.11	7.3
TOTAL AGRICULTURE	168,901	179,829	200,702	6.47	11.61	174,469	172,308	180,672	1.25	3.56

VOLUME AND VALUE OF PRODUCTION, BY CROP SHARE, CALENDAR YEAR 1988

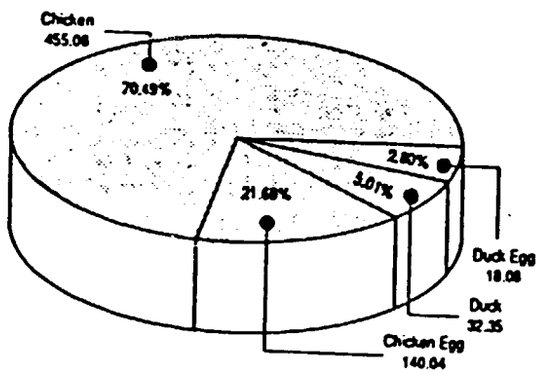
VOLUME



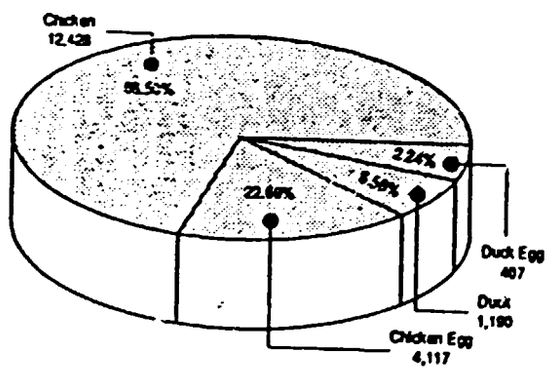
VALUE



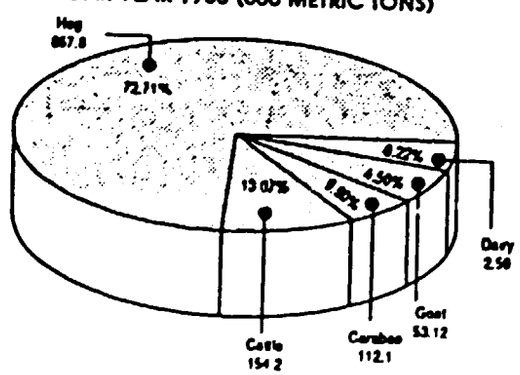
POULTRY, % SHARE OF VOLUME: CALENDAR YEAR 1988 (000 METRIC TONS)



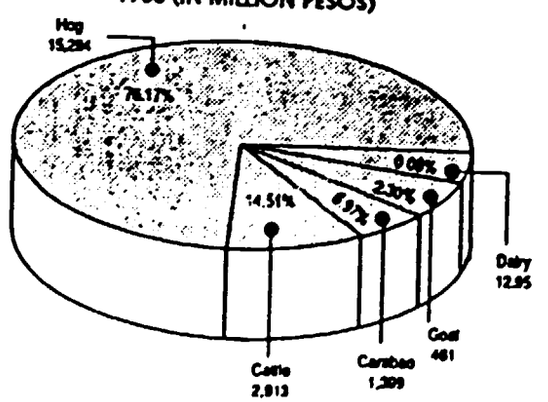
POULTRY, % SHARE OF VALUE: CALENDAR YEAR 1988 (IN MILLION PESOS)



LIVESTOCK, % SHARE OF VOLUME: CALENDAR YEAR 1988 (000 METRIC TONS)



LIVESTOCK, % SHARE OF VALUE: CALENDAR YEAR 1988 (IN MILLION PESOS)



TOP 10 CROPS - PHILIPPINES: 1'

VOLUME	*Metric Tons (000)*	*Share to Total Production %*
Sugarcane	13,940	24.94
Coconut	10,800	19.32
Palay	8,971	16.05
Corn	4,428	7.92
Banana	3,645	6.52
Pineapple	2,350	4.20
Cassava	1,866	3.34
Camote	900	1.61
Mango	289	0.52
Tomato	167	0.30

VALUE	*Constant 1985 Prices (Million Pesos)*	*Share to Total Value %*
Palay	28,976	27.08
Coconut	15,336	14.33
Corn	12,398	11.59
Banana	5,577	5.21
Sugarcane	4,461	4.17
Pineapple	4,371	4.08
Coffee	3,386	3.16
Cassava	2,463	2.30
Mango	1,980	1.85
Camote	1,683	1.57

CROP PRODUCTION - PHILI ES: 1980 TO 1987
VOLUME (metric tons)

	1980	1981	1982	1983	1984	1985	1986p	1987p
Palay	7,835,795	7,722,750	8,122,725	7,730,525	7,840,935	8,200,090	9,096,980	8,957,760
Corn	3,122,843	3,109,685	3,290,175	3,125,885	3,346,235	3,438,755	3,922,020	4,015,040
Coconut	4,570,165	4,312,114	3,785,479	3,381,630	2,921,870	2,964,846	3,162,389	3,262,503
Sugar	3,120,803	3,193,044	3,402,698	3,435,616	3,260,178	2,747,650	2,135,316	1,861,170
Fruits and Nuts	6,362,101	6,432,299	6,537,283	6,471,596	6,432,644	6,029,540	6,236,558	6,819,498
Vegetables	790,159	798,567	826,531	676,884	725,179	718,726	740,942	306,742
Beans and Peas	47,306	48,528	50,262	36,920	37,994	41,229	37,719	36,167
Rootcrops	3,506,594	3,443,744	3,214,204	2,142,977	2,323,119	2,495,652	2,716,996	2,736,053
Fiber Crops	167,339	140,670	134,538	101,040	101,793	94,794	99,664	135,394
Beverage Crops	129,426	150,883	176,753	152,400	121,589	138,587	142,750	141,875
Other Crops	113,639	113,427	127,875	168,879	190,392	193,895	210,998	195,951
Total	29,766,170	29,465,711	29,668,523	27,424,352	27,301,928	27,063,764	28,502,332	28,468,158

VALUE (thousand pesos)

	1980	1981	1982	1983	1984	1985	1986p	1987p
Palay	8,376,578	9,304,542	10,924,143	10,721,949	15,311,787	24,969,482	27,982,992	25,503,872
Corn	3,024,055	3,501,729	3,985,664	3,949,339	5,166,842	9,542,595	9,842,116	10,922,913
Coconut	9,263,754	6,332,104	5,354,293	3,793,863	12,270,130	12,628,675	4,496,119	8,231,642
Sugar	4,226,711	8,558,760	6,881,287	7,218,977	11,150,369	9,277,963	7,662,909	8,562,863
Fruits and Nuts	5,429,174	6,156,746	6,983,080	6,311,270	9,366,331	11,651,902	13,628,771	13,795,895
Vegetables	1,684,083	1,804,664	1,866,943	1,491,017	2,364,960	3,211,394	3,430,578	938,551
Beans and Peas	226,193	293,341	253,917	180,300	322,033	421,009	406,777	419,594
Rootcrops	1,977,875	2,277,433	2,274,449	1,625,807	2,561,837	3,616,854	4,179,626	4,160,442
Fiber Crops	472,067	407,671	361,049	322,209	629,828	741,125	726,817	1,297,800
Beverage Crops	2,768,970	3,145,376	1,887,970	1,786,609	2,925,620	3,751,739	4,071,798	5,586,069
Other Crops	461,140	529,722	504,192	679,634	1,369,352	1,502,791	1,265,969	1,813,014
Total	37,910,600	42,312,088	41,276,987	38,080,974	63,439,089	81,315,529	77,694,472	81,232,655

AREA HARVESTED (hectares)

	1980	1981	1982	1983	1984	1985	1986p	1987p
Palay	3,636,810	3,459,130	3,442,830	3,239,630	3,140,670	3,221,770	3,402,610	3,402,910
Corn	3,201,070	3,238,690	3,360,700	3,157,480	3,270,210	3,314,580	3,544,730	3,564,480
Coconut	3,125,920	3,105,520	3,162,300	3,187,400	3,216,080	3,274,940	3,261,473	3,360,020
Sugar	424,640	421,080	470,830	423,285	479,384	407,142	355,945	274,250
Fruits and Nuts	576,800	563,630	595,510	575,100	564,300	573,175	589,630	522,700
Vegetables	138,130	138,550	141,910	128,430	126,550	130,500	133,250	70
Beans and Peas	66,520	68,590	69,360	47,280	48,650	51,290	49,630	48,080
Rootcrops	490,470	480,450	483,620	427,490	423,170	425,820	426,960	423,330
Fiber Crops	244,380	243,830	221,710	180,870	180,780	179,270	173,110	180,080
Beverage Crops	106,510	126,090	146,560	148,645	151,830	158,160	163,170	168,180
Other Crops	115,930	109,880	114,820	118,310	131,490	123,570	132,490	131,900
Total	12,127,180	11,955,240	12,210,150	11,633,920	11,733,114	11,860,217	12,232,998	12,147,930

CORN

VOLUME (metric tons)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	41,065	41,790	51,410	60,265	63,905	69,035	64,530	71,130
Cagayan Valley	325,045	206,965	252,405	257,375	257,070	325,050	374,835	367,340
Central Luzon	6,945	5,055	6,390	5,605	6,105	6,740	8,370	9,700
Southern Tagalog	315,925	309,085	246,725	257,610	202,510	230,825	242,305	250,140
Bicol	111,765	108,045	99,855	97,780	124,315	115,375	133,975	134,430
Western Visayas	36,334	39,345	46,985	39,395	51,440	33,430	43,740	52,670
Central Visayas	241,135	223,795	241,045	245,395	282,445	213,605	243,645	259,775
Eastern Visayas	161,190	189,780	219,135	190,315	201,360	223,430	237,020	214,080
Western Mindanao	163,880	179,600	186,985	195,065	212,895	172,545	216,700	212,305
Northern Mindanao	239,349	212,820	213,960	183,550	232,850	199,850	252,850	261,715
Southern Mindanao	993,995	1,001,665	1,067,930	1,038,790	1,052,540	1,107,975	1,203,315	1,264,070
Central Mindanao	486,215	591,740	657,350	554,740	658,800	740,895	900,735	917,685
PHILIPPINES	3,122,843	3,109,685	3,290,175	3,125,885	3,346,235	3,438,755	3,922,020	4,015,040

VALUE (thousand pesos)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	49,871	54,618	65,556	93,334	148,793	205,009	186,927	241,842
Cagayan Valley	323,526	258,760	334,851	377,346	492,620	1,016,925	1,051,507	1,079,980
Central Luzon	5,768	6,810	8,239	8,151	12,275	20,328	22,462	29,100
Southern Tagalog	319,501	373,362	348,286	344,771	396,979	666,569	672,803	632,854
Bicol	117,246	128,125	133,580	127,852	193,651	302,850	355,940	376,404
Western Visayas	38,183	51,171	65,599	55,054	82,161	95,104	128,137	153,796
Central Visayas	247,460	259,499	291,283	325,766	421,773	559,901	645,933	779,325
Eastern Visayas	167,452	214,807	259,128	252,562	341,402	539,849	595,219	620,832
Western Mindanao	136,644	187,765	209,775	238,787	284,269	442,918	508,091	564,731
Northern Mindanao	213,792	226,428	242,726	215,517	313,876	556,738	603,189	717,099
Southern Mindanao	948,743	1,096,793	1,296,897	1,270,657	1,518,009	3,173,918	2,999,157	3,552,037
Central Mindanao	455,169	643,991	729,744	639,542	961,534	1,963,486	2,072,751	2,174,913
PHILIPPINES	3,024,055	3,501,729	3,985,664	3,949,339	5,166,842	9,542,595	9,842,116	10,922,913

AREA HARVESTED (hectares)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	54,030	54,620	61,850	64,180	71,420	72,100	74,990	80,320
Cagayan Valley	322,640	289,320	297,470	310,830	294,800	314,960	331,180	332,540
Central Luzon	8,580	8,210	7,950	7,620	9,250	8,820	10,240	11,440
Southern Tagalog	218,720	254,040	271,280	2[illegible],040	239,220	242,470	249,590	251,180
Bicol	163,660	179,040	164,210	155,160	169,940	160,840	176,500	181,630
Western Visayas	68,030	73,610	73,900	59,580	70,780	67,630	91,730	105,650
Central Visayas	485,730	470,870	487,860	463,100	492,600	483,200	520,130	519,830
Eastern Visayas	167,380	187,840	204,020	200,890	198,760	199,300	214,830	224,790
Western Mindanao	224,270	266,420	275,570	266,180	279,590	261,880	289,730	283,380
Northern Mindanao	298,500	241,340	232,560	204,580	216,560	222,490	238,170	246,220
Southern Mindanao	732,360	748,650	798,240	750,120	764,420	767,010	778,070	757,770
Central Mindanao	437,170	464,730	485,790	403,200	462,830	513,880	569,570	569,730
PHILIPPINES	3,201,070	3,238,690	3,360,700	3,157,480	3,270,210	3,314,580	3,544,730	3,564,480

SUGAR

VOLUME (metric tons)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	8,432	7,935	9,192	10,938	5,048	4,035	7,576	20,800
Cagayan Valley	21,855	34,366	48,497	41,331	41,639	33,280	16,615	9,064
Central Luzon	324,914	297,972	289,530	312,679	275,321	260,112	197,127	190,805
Southern Tagalog	357,485	415,438	359,633	387,796	333,579	311,747	303,218	281,714
Bicol	44,830	51,746	55,749	57,383	44,288	30,852	13,536	12,215
Western Visayas	1,839,399	1,853,005	2,016,645	1,965,668	1,877,161	1,586,760	1,149,153	978,131
Central Visayas	279,586	267,520	282,765	314,711	298,254	252,246	205,072	199,230
Eastern Visayas	105,444	89,742	118,284	106,081	110,280	70,731	61,519	56,962
Western Mindanao	2	2	18	3	3	4	8	7
Northern Mindanao	83,785	113,492	125,838	139,751	164,674	128,297	122,711	77,787
Southern Mindanao	30,550	31,013	43,024	48,937	39,577	33,045	34,690	27,171
Central Mindanao	24,521	30,813	53,523	57,338	70,354	36,541	24,091	7,284
PHILIPPINES	3,120,803	3,193,044	3,402,698	3,435,616	3,260,178	2,747,650	2,135,316	1,861,170

VALUE (thousand pesos)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	12,308	17,453	19,310	30,231	26,819	40,529	55,525	108,833
Cagayan Valley	30,953	92,957	105,060	90,209	149,723	124,742	62,424	41,400
Central Luzon	429,043	752,878	575,348	655,404	918,368	964,036	702,863	867,643
Southern Tagalog	490,268	1,083,506	727,355	791,700	1,089,885	1,151,229	1,080,784	1,286,017
Bicol	57,350	121,040	104,424	127,199	159,346	116,723	55,251	55,930
Western Visayas	2,503,891	5,053,004	4,042,561	4,134,472	6,460,791	4,957,095	4,104,756	4,514,549
Central Visayas	377,002	725,152	615,756	667,300	1,022,754	917,660	714,688	923,258
Eastern Visayas	139,294	234,847	233,361	209,485	371,177	250,199	221,933	255,122
Western Mindanao	3	5	39	10	19	26	50	48
Northern Mindanao	115,608	310,075	261,648	290,200	562,782	472,681	430,398	346,260
Southern Mindanao	39,474	81,043	83,422	97,760	132,728	117,054	123,620	121,400
Central Mindanao	31,517	86,800	113,003	125,007	255,977	165,989	110,617	42,403
PHILIPPINES	4,226,711	8,558,760	6,881,287	7,218,977	11,150,369	9,277,963	7,662,909	8,562,863

AREA HARVESTED (hectares)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	3,530	8,510	2,710	2,955	1,800	1,440	2,240	3,960
Cagayan Valley	5,260	7,240	10,540	10,510	7,810	8,218	6,970	2,830
Central Luzon	49,560	44,370	56,750	47,782	52,425	37,244	35,775	33,500
Southern Tagalog	47,640	45,020	50,640	47,595	50,699	46,114	45,390	35,080
Bicol	8,880	9,410	10,620	11,307	10,654	9,694	5,870	3,750
Western Visayas	230,350	228,280	250,470	221,456	254,832	206,038	183,130	141,020
Central Visayas	38,800	36,550	41,180	38,562	46,394	44,153	38,330	25,520
Eastern Visayas	17,920	18,910	16,340	16,050	14,667	14,911	10,760	10,630
Western Mindanao	10	10	30	20	20	20	30	30
Northern Mindanao	10,260	12,010	15,800	13,852	19,036	20,113	18,000	9,500
Southern Mindanao	7,750	5,010	9,380	7,231	8,120	7,250	6,390	5,950
Central Mindanao	4,650	4,960	6,370	5,965	10,927	11,947	3,060	2,480
PHILIPPINES	424,640	421,080	470,830	423,285	479,384	407,142	355,945	274,250

BEANS AND PEAS - PHILIPPINES: 1980 1987

VOLUME (metric tons)

	1980	1981	1982	1983	1984	1985	1986p	1987p
Drybeans and others	5,117	4,937	4,526	3,530	3,866	5,895	5,498	4,564
Mongo	32,794	33,534	34,270	25,286	26,510	26,855	25,733	25,915
Soybeans	9,395	10,057	11,466	8,104	7,618	8,479	6,488	5,698
Total	47,306	48,528	50,262	36,920	37,994	41,229	37,719	36,167

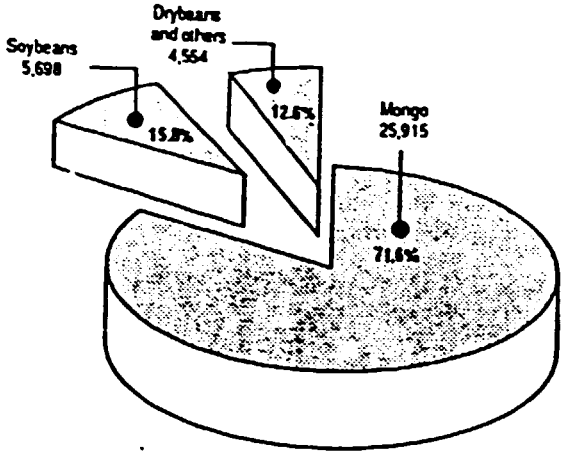
VALUE (thousand pesos)

	1980	1981	1982	1983	1984	1985	1986p	1987p
Drybeans and others	18,582	14,539	13,282	14,785	22,245	39,402	49,566	46,001
Mongo	181,745	248,315	199,509	137,125	263,889	320,479	312,279	328,424
Soybeans	25,866	30,487	41,126	28,390	35,899	61,128	44,932	45,169
Total	226,193	293,341	253,917	180,300	322,033	421,009	406,777	419,594

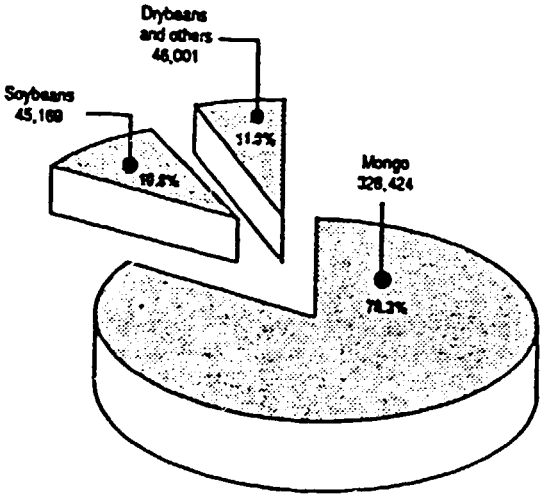
AREA HARVESTED (hectares)

	1980	1981	1982	1983	1984	1985	1986p	1987p
Drybeans and others	6,580	6,340	6,270	4,800	5,450	5,430	5,280	4,860
Mongo	50,360	51,840	52,190	33,890	35,460	37,430	37,490	36,730
Soybeans	9,580	10,410	10,900	8,590	7,740	8,430	6,860	6,490
Total	66,520	68,590	69,360	47,280	48,650	51,290	49,630	48,080

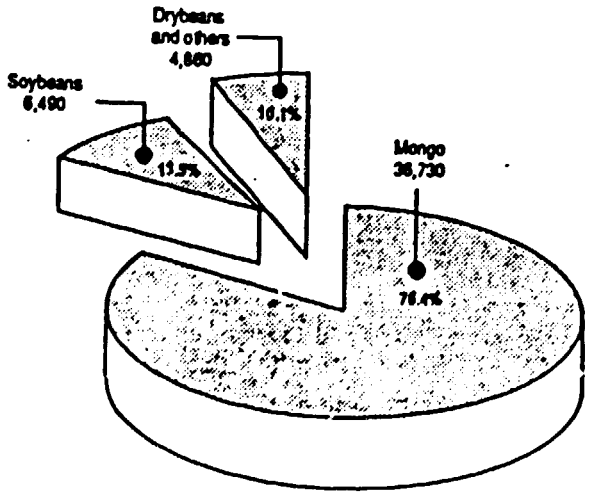
"EANS AND PEAS, % SHARE OF VOLUME:198



BEANS AND PEAS, % SHARE OF VALUE:1987



BEANS AND PEAS, % SHARE OF AREA HARVESTED:1987



SOYBEANS

VOLUME (metric tons)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	41	34	10	29	25	23	11	7
Cagayan Valley	38	31	8	5	4	7	11	15
Central Luzon	3	1	2	0	561	531	16	11
Southern Tagalog	66	46	55	53	53	24	24	206
Bicol	21	7	4	6	5	3	1	bA
Western Visayas	367	283	288	252	170	124	58	47
Central Visayas	183	150	141	51	129	181	201	139
Eastern Visayas	9	9	10	15	18	16	15	15
Western Mindanao	55	58	46	31	30	23	50	69
Northern Mindanao	2,254	2,214	3,651	1,812	1,595	2,223	687	568
Southern Mindanao	6,277	7,112	7,144	5,752	4,892	4,709	4,831	4,062
Central Mindanao	81	112	107	98	136	615	583	589
PHILIPPINES	9,395	10,057	11,466	8,104	7,618	8,479	6,698	5,698

VALUE (thousand pesos)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	310	212	63	174	191	149	151	107
Cagayan Valley	247	136	57	36	45	93	98	154
Central Luzon	12	7	9	0	5,043	4,946	160	132
Southern Tagalog	320	369	466	452	544	247	246	1,909
Bicol	34	12	10	31	38	31	25	0
Western Visayas	1,175	865	1,185	1,470	1,587	1,346	568	626
Central Visayas	881	538	484	229	698	838	1,696	1,451
Eastern Visayas	69	84	65	75	128	116	119	119
Western Mindanao	308	377	283	133	158	130	193	361
Northern Mindanao	6,275	6,738	12,373	6,492	7,143	13,302	4,800	4,748
Southern Mindanao	15,621	20,757	25,735	18,967	19,619	33,925	32,956	31,600
Central Mindanao	314	392	396	331	705	6,005	3,922	3,962
PHILIPPINES	25,866	30,487	41,126	28,390	35,899	61,128	44,932	45,169

AREA HARVESTED (hectares)

Regions	1980	1981	1982	1983	1984	1985	1986p	1987p
Ilocos	70	60	20	20	10	10	20	20
Cagayan Valley	190	170	40	10	10	10	10	10
Central Luzon	10	...	0	0	270	280	20	10
Southern Tagalog	90	80	80	80	80	40	40	50
Bicol	30	20	10	20	20	10	...	cA
Western Visayas	410	370	380	350	250	200	100	80
Central Visayas	200	170	170	80	150	200	220	240
Eastern Visayas	10	10	10	20	20	20	20	20
Western Mindanao	80	80	80	100	100	70	140	120
Northern Mindanao	1,470	1,590	2,820	1,590	1,400	1,880	720	680
Southern Mindanao	6,930	7,760	7,140	6,190	5,270	5,060	4,950	4,680
Central Mindanao	90	100	150	130	160	650	610	610
PHILIPPINES	9,580	10,410	10,900	8,590	7,740	8,430	6,860	6,490

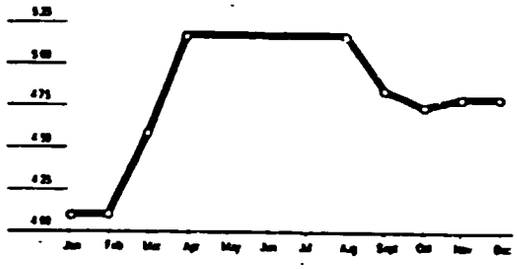
RETAIL PRICES IN METRO MANILA
(Value in pesos)

COMMODITY	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	Ann. Ave.
RICE (kilo)													
Special													
1984	3.80	3.80	3.80	3.80	4.27	5.00	6.15	6.51	6.39	6.53	NA	NA	5.01
1985	NA	NA	7.00	NA	7.39	7.00	NA	NA	7.94	NA	NA	7.50	7.37
1986	7.50	7.50	NA	7.50	7.50	7.50	7.50	7.50	NA	NA	7.51	7.50	7.50
1987	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
1988	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	8.00	8.00	7.58
Ordinary													
1984	3.80	3.80	3.80	3.80	3.88	4.67	4.85	4.85	4.85	5.03	NA	NA	4.33
1985	NA	NA	6.50	NA	6.50	6.50	NA	NA	6.78	NA	NA	6.20	6.50
1986	6.20	6.24	NA	6.36	6.18	6.07	7.01	6.17	NA	NA	6.26	6.20	6.30
1987	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1988	6.50	6.50	6.50	6.50	6.50	6.50	7.00	7.00	7.00	7.00	7.00	7.00	6.75
CORN (kilo)													
Yellow (grain)													
1984	3.02	3.16	3.32	3.54	3.70	3.90	4.23	4.50	4.50	4.68	5.00	NA	3.96
1985	NA	NA	5.79	NA	6.25	6.00	NA	NA	5.79	NA	NA	5.50	5.87
1986	5.50	5.53	NA	5.50	5.56	5.50	5.58	5.79	NA	NA	5.63	5.50	5.56
1987	5.50	5.50	5.50	5.50	5.50	6.00	6.00	6.00	6.00	6.00	6.00	6.00	5.79
1988	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
White (grain)													
1984	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1985	NA	NA	6.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.14
1986	NA	5.95	NA	5.63	5.67	6.00	6.00	6.00	NA	NA	NA	NA	5.88
1987	NA	6.00	6.00	6.00	6.00	6.50	6.50	6.50	NA	NA	NA	NA	6.21
1988	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
FISH (kilo)													
Alumahan													
1984	18.92	19.41	18.92	18.69	17.74	20.46	20.46	20.56	23.25	22.97	28.33	27.36	21.42
1985	29.60	28.88	26.94	NA	25.38	26.60	26.65	27.13	26.76	27.63	27.33	27.93	27.35
1986	32.92	30.37	NA	27.83	25.62	22.65	24.46	26.65	25.76	27.07	NA	NA	27.04
1987	30.60	32.50	29.50	24.67	20.00	25.33	23.60	21.50	26.33	23.00	25.83	30.00	26.07
1988	28.00	24.00	30.00	30.00	30.00	26.00	28.00	28.00	28.00	26.00	30.00	40.00	29.00
Bangus													
1984	20.14	20.83	20.14	20.56	20.30	20.15	18.69	19.93	20.67	21.48	24.54	26.58	21.17
1985	28.54	28.20	27.93	NA	26.30	23.90	24.37	28.09	29.08	27.32	29.36	30.53	27.60
1986	37.59	34.24	NA	30.43	29.72	27.40	25.67	26.60	27.59	27.34	29.67	31.25	29.77
1987	36.00	36.25	34.25	31.66	30.00	29.33	28.00	27.00	26.67	28.00	29.71	30.00	30.57
1988	40.00	30.00	40.00	35.00	35.00	35.00	30.00	32.00	32.00	30.00	38.00	45.00	35.17

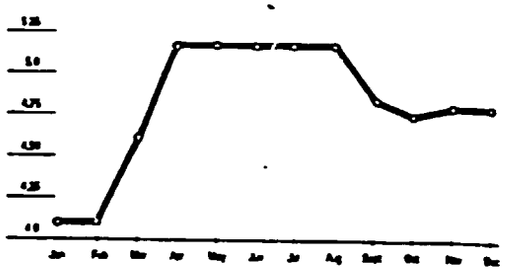
CORN (kilo)

Yellow (grain)													
1984	2.68	2.80	2.87	2.92	2.91	3.58	3.96	3.97	3.40	3.27	3.89	NA	3.30
1985	NA	NA	5.22	NA	4.50	4.23	NA	NA	4.49	NA	NA	3.50	4.39
1986	3.67	3.58	NA	4.34	4.44	4.32	4.34	4.50	NA	NA	4.30	4.50	4.22
1987	NA	NA	NA	4.33	4.65	4.45	4.50	4.50	4.50	4.40	4.10	4.20	4.40
1988	4.10	4.10	4.60	5.18	5.18	5.18	5.18	5.18	4.85	4.75	4.80	4.80	4.83

AVERAGE WHOLESALE PRICES OF YELLOW CORN IN METRO MANILA: 1988
(Value in Pesos)



ANNUAL AVERAGE WHOLESALE PRICES OF YELLOW CORN IN METRO MANILA: 1984 TO 1988
(Value in Pesos)



FISH (kilo)

Alumahan													
1984	13.36	15.04	13.60	14.26	13.36	13.92	14.17	14.81	15.05	15.71	17.04	17.57	14.82
1985	18.56	18.92	18.87	NA	18.95	18.54	18.05	19.56	18.99	23.75	21.45	21.62	19.48
1986	24.26	20.02	NA	16.86	16.24	14.33	17.41	19.37	18.86	18.35	NA	NA	18.41
1987	21.11	18.36	15.72	12.15	12.92	13.42	21.55	16.15	19.07	14.66	17.94	23.34	17.20
1988	21.66	19.44	17.22	19.16	18.78	18.44	18.33	20.56	16.11	17.22	26.88	27.66	20.12
Bangus													
1984	14.17	14.84	14.37	14.58	14.72	14.03	14.04	13.79	14.65	15.14	16.21	16.55	14.76
1985	17.73	18.27	21.04	NA	18.55	18.11	20.84	23.08	21.94	22.99	22.98	24.23	20.71
1986	29.70	NA	NA	23.60	20.69	16.07	19.90	19.42	22.37	22.02	23.46	24.98	22.02
1987	26.37	24.11	26.29	20.94	16.08	19.42	22.35	20.84	19.27	24.17	NA	32.50	22.94
1988	25.56	29.16	29.44	25.84	23.36	18.94	25.00	22.72	22.78	23.61	33.34	36.94	26.38
Bisugo													
1984	13.87	16.56	14.38	14.25	13.90	14.01	14.40	12.79	15.32	16.14	17.47	19.76	15.24
1985	19.00	19.79	19.56	NA	19.57	19.22	19.39	20.22	20.52	20.82	22.72	21.50	20.21
1986	24.45	20.73	NA	19.00	19.13	17.78	18.64	20.18	18.65	18.19	19.83	21.46	19.82
1987	23.72	19.33	17.50	14.44	14.00	NA	18.66	19.26	24.83	18.58	NA	26.11	19.64
1988	20.00	18.22	19.44	16.00	17.22	NA	20.56	21.34	17.44	NA	25.56	29.44	20.52
Galunggong													
1984	12.75	13.81	11.74	11.82	11.84	11.89	12.07	12.71	13.64	14.50	15.93	16.43	13.26
1985	17.84	17.96	16.21	NA	15.91	15.85	16.56	19.37	16.62	17.18	17.65	18.56	17.25
1986	20.73	18.04	NA	11.65	15.85	12.35	14.70	16.04	15.84	14.11	19.24	21.55	16.37
1987	21.08	18.19	11.72	8.74	8.75	9.10	12.24	10.39	16.73	16.30	15.14	21.16	14.13
1988	16.11	16.11	14.44	15.83	13.34	15.84	17.78	16.11	13.88	15.56	23.88	30.00	17.41

CORN (White grain)
(pesos per 50-kg sack)

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANN.AVE
Ilocos													
1984	117.50	115.00	136.66	135.00	140.00	130.00	120.00	124.58	-	-	-	-	127.34
1985	-	-	-	-	-	-	165.00	170.00	-	-	-	-	167.50
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-	-
Cagayan Valley													
1984	91.43	102.50	108.32	108.73	143.33	124.44	131.67	120.70	130.55	137.16	185.00	185.43	130.77
1985	185.71	172.25	171.62	157.05	165.00	169.63	140.71	129.52	132.50	131.85	147.29	153.89	154.75
1986	154.17	152.50	154.46	158.16	153.13	145.00	153.75	139.29	134.74	138.93	133.00	149.83	146.54
1987	156.88	144.58	153.04	158.27	167.14	225.00	-	100.00	-	146.67	165.25	150.00	156.68
1988	-	-	196.00	202.50	300.00	30.00	-	172.00	266.50	-	-	-	239.50
Central Luzon													
1984	-	-	-	-	-	120.00	133.33	148.75	-	-	-	-	134.03
1985	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	225.00	150.00	-	-	-	-	-	187.50
1988	-	-	-	-	-	-	100.00	160.00	175.00	-	-	-	145.00
Southern Tagalog													
1984	141.67	118.33	-	128.33	147.50	-	128.33	132.00	-	-	-	-	132.69
1985	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	184.50	-	-	-	255.00	-	-	219.75
1988	-	-	-	-	-	250.00	-	241.50	-	-	-	-	245.75
Bicol													
1984	85.75	87.50	-	101.00	88.40	108.75	110.00	118.75	108.00	-	130.00	132.50	107.07
1985	-	-	147.00	133.50	-	-	-	139.50	120.89	124.17	-	-	133.01
1986	140.00	137.00	135.00	145.00	142.50	143.75	145.00	-	121.11	140.00	-	-	138.82
1987	-	-	-	-	-	-	-	-	136.50	-	-	-	136.50
1988	-	-	-	143.25	149.50	-	-	-	115.50	-	-	-	136.08
Western Visayas													
1984	75.50	85.00	107.05	108.66	105.00	105.20	107.50	107.11	120.94	-	116.00	122.00	105.45
1985	-	158.33	-	-	140.11	160.39	151.83	-	-	-	-	-	152.67
1986	142.83	150.00	-	-	-	-	122.08	120.45	115.00	116.60	125.00	127.00	127.43
1987	132.20	-	-	-	-	-	-	-	-	-	-	-	132.20
1988	-	-	-	-	-	-	-	-	-	110.50	-	-	110.50
Central Visayas													
1984	88.75	96.25	110.00	89.58	126.08	113.33	121.25	120.83	128.46	143.57	162.50	166.25	122.24
1985	-	-	195.00	170.00	-	149.50	133.68	127.18	114.29	153.89	143.57	133.33	146.72
1986	-	145.83	-	-	123.33	124.64	125.00	118.75	125.00	120.00	130.00	135.00	127.51
1987	-	-	-	155.00	146.00	-	-	170.50	140.50	123.50	119.50	132.00	141.00
1988	-	-	180.00	172.50	190.00	-	124.00	95.50	118.50	122.20	-	-	143.24

	JAN	FE	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANN. AVE.
Eastern Visayas													
1984	72.58	79.00	-	107.50	163.33	123.75	112.00	115.83	-	-	-	-	110.57
1985	-	-	-	-	-	136.67	131.42	118.33	116.71	127.92	115.00	116.00	123.15
1986	-	-	-	132.17	-	128.21	120.00	130.00	120.00	116.25	115.67	109.88	121.52
1987	-	-	-	-	141.25	-	166.75	162.25	129.50	125.00	111.50	109.50	135.11
1988	-	-	155.00	130.00	135.50	118.00	124.00	108.50	118.00	119.00	-	-	126.00
Western Mindanao													
1984	75.00	83.52	101.08	102.93	90.61	107.36	107.04	114.14	126.87	131.24	161.35	146.64	112.32
1985	140.91	143.33	138.33	154.50	143.75	126.84	116.92	106.40	112.25	113.81	121.58	121.07	128.31
1986	126.14	130.77	132.94	125.45	148.11	113.44	111.30	111.67	103.56	111.82	123.38	119.64	121.52
1987	120.87	133.50	128.21	-	182.00	-	-	111.00	116.50	115.00	126.50	130.00	129.29
1988	135.00	113.50	152.50	164.50	146.50	-	137.50	104.75	118.25	125.50	-	-	119.17
Northern Mindanao													
1984	78.27	80.62	86.47	95.57	108.00	110.02	120.26	124.13	126.96	148.82	153.96	153.10	115.52
1985	167.65	168.53	170.77	169.54	161.09	131.33	116.42	112.21	109.77	117.76	116.97	124.59	138.89
1986	130.25	143.56	132.86	128.64	132.82	115.89	120.56	117.50	111.50	112.68	115.36	116.15	127.15
1987	130.28	137.11	143.65	150.75	155.77	141.50	160.50	-	114.50	106.00	119.00	135.00	135.82
1988	134.50	146.50	147.50	149.50	143.50	155.50	109.50	-	-	103.50	-	-	136.25
Southern Mindanao													
1984	85.72	91.34	99.74	104.29	107.00	123.75	115.29	121.29	135.79	151.16	151.35	152.04	119.90
1985	162.13	171.76	169.43	167.85	150.89	140.00	122.33	116.74	122.28	128.90	129.91	128.75	142.58
1986	142.20	149.48	146.90	140.57	141.31	113.91	109.45	114.55	110.94	117.50	119.34	120.10	123.19
1987	133.02	141.12	150.02	157.56	162.81	131.25	155.25	-	128.25	129.00	121.00	137.25	140.59
1988													
Central Mindanao													
1984	77.71	87.97	97.50	101.80	101.37	105.94	110.88	116.75	120.52	136.36	149.46	149.57	112.99
1985	159.60	162.62	154.43	146.50	136.67	132.71	122.74	108.29	104.82	113.21	119.03	127.19	132.32
1986	128.44	128.77	129.25	131.21	124.93	112.14	103.79	100.75	106.33	110.21	107.79	109.09	115.98
1987	111.64	120.69	147.10	169.13	147.52	-	140.67	106.00	119.00	100.00	121.50	129.50	128.43
1988	-	135.25	144.00	146.50	150.00	-	108.50	95.50	108.50	138.50	-	-	128.34

CORN (Yellow grain)
(pesos per 50-kg sack)

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANN.AV
Ilocos													
1984	-	133.00	145.00	-	142.50	133.33	134.00	141.75	-	-	-	-	138.26
1985	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-	-
Cagayan Valley													
1984	98.00	103.57	106.46	108.69	109.41	116.11	135.36	125.30	115.55	132.07	178.75	186.10	126.28
1985	178.75	175.96	169.12	155.71	157.75	164.94	137.27	123.20	130.98	126.78	138.75	145.00	150.35
1986	145.00	153.57	155.83	154.20	152.78	150.83	153.13	140.56	129.09	130.45	133.75	133.86	144.42
1987	137.50	150.00	157.31	159.90	166.35	-	-	-	-	147.00	158.00	171.50	155.94
1988	-	-	150.00	148.00	154.50	155.00	-	179.00	134.50	-	-	-	153.50
Southern Tagalog													
1984	117.50	114.55	108.83	102.80	123.28	122.14	123.75	138.31	134.21	-	112.50	135.00	121.17
1985	-	-	170.50	-	-	-	-	141.43	132.73	-	129.38	135.83	141.97
1986	131.00	-	140.00	133.33	-	137.50	140.00	-	114.29	112.22	105.00	105.00	124.26
1987	-	-	-	-	-	-	-	-	150.00	-	-	-	150.00
1988	-	-	-	-	-	-	-	225.00	-	113.00	-	-	169.00
Bicol													
1984	82.33	87.33	102.50	106.83	108.84	118.54	127.50	123.12	128.63	122.86	127.50	142.50	114.87
1985	160.71	169.06	163.30	156.82	157.95	160.21	156.78	130.83	113.14	-	145.00	136.25	150.00
1986	150.00	-	-	145.45	149.09	151.58	148.89	120.00	123.75	128.00	128.33	128.75	137.38
1987	135.83	139.83	151.41	156.58	-	168.50	182.50	154.50	137.00	138.00	161.50	170.00	154.06
1988	-	-	153.50	157.00	155.00	158.50	137.00	117.50	115.50	-	-	-	142.00
Western Visayas													
1984	77.67	87.43	104.90	111.02	137.42	116.47	127.02	123.38	133.34	128.75	126.06	125.83	116.61
1985	-	175.64	185.01	182.71	157.06	188.19	159.60	127.79	128.08	124.00	137.67	154.59	156.39
1986	-	-	145.00	150.41	158.27	148.35	136.90	126.14	123.70	136.83	139.46	141.39	140.65
1987	123.91	171.59	159.90	151.96	168.21	-	-	177.00	133.50	138.50	148.00	150.00	152.26
1988	-	166.50	170.00	154.00	160.00	-	142.00	131.00	128.00	121.50	-	-	146.62
Central Visayas													
1984	-	-	96.50	85.00	148.50	108.33	122.50	106.67	108.33	-	-	-	110.83
1985	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	116.50	-	-	-	116.50
1988	-	123.00	-	-	-	-	-	-	-	-	-	-	123.00
Western Mindanao													
1984	68.86	82.25	119.16	95.00	96.66	103.60	94.10	123.33	120.83	-	-	-	100.42
1985	-	147.50	-	-	-	-	-	-	118.50	114.00	128.00	123.00	126.20
1986	125.00	-	-	-	-	-	120.00	-	115.00	120.00	-	-	120.00
1987	-	-	-	-	-	181.50	-	166.50	-	143.50	155.50	158.00	160.80
1988	-	131.50	153.00	157.50	158.00	-	-	143.00	142.00	-	-	-	147.50

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANN. AVE.
Northern Mindanao													
1984	72.81	76.15	87.50	91.66	97.66	105.00	112.50	119.00	-	123.33	-	-	98.40
1985	145.17	163.75	-	-	-	-	-	-	-	113.93	111.43	-	133.57
1986	127.50	-	-	-	-	-	-	-	103.00	104.58	-	119.90	113.75
1987	138.69	150.00	150.00	153.00	-	-	-	142.00	118.00	137.50	143.00	141.00	143.69
1988	145.00	152.00	145.00	147.00	146.00	-	149.50	106.50	-	-	-	-	141.57
Southern Mindanao													
1984	93.50	97.55	95.85	110.91	111.90	121.81	117.86	127.17	140.00	-	165.00	166.00	122.32
1985	-	-	172.32	-	139.00	-	122.83	118.36	123.20	120.83	-	126.80	131.91
1986	138.50	155.07	150.28	148.21	145.00	115.80	108.64	113.25	140.00	-	-	-	134.97
1987	138.00	148.00	155.42	-	-	-	149.00	120.50	126.00	126.00	126.50	125.00	134.94
1988	-	-	-	-	-	-	72.50	-	108.00	-	-	-	90.25
Central Mindanao													
1984	79.66	86.14	106.50	100.00	98.90	111.25	111.94	115.90	116.12	137.05	146.96	141.43	112.65
1985	-	-	145.53	142.44	125.00	112.81	114.26	110.00	106.42	103.08	114.25	120.42	119.47
1986	123.80	139.63	149.45	136.83	120.72	104.50	102.58	100.31	105.26	113.00	114.38	105.00	117.96
1987	104.00	-	-	155.36	139.54	-	155.00	122.00	119.00	108.00	-	-	128.99
1988	139.50	165.00	142.50	144.00	-	-	105.00	105.00	110.00	141.50	-	-	131.56

Note: No data for Central Luzon and Eastern Visayas.

SOYBEANS
(pesos per kilo)

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANN.AV:
Southern Mindanao													
1984	3.92	4.13	4.00	4.32	5.98	4.73	4.71	4.84	5.13	5.78	5.98	6.13	4.97
1985	7.43	8.38	8.95	10.10	9.33	7.46	6.18	6.07	4.86	6.13	5.36	-	7.30
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	6.50	-	-	-	4.70	-	-	-	-	4.17	4.03	-	4.85
1988	-	-	-	-	-	-	-	-	-	6.25	-	-	6.25
Central Mindanao													
1984	-	-	-	3.20	3.50	3.50	4.75	-	-	-	7.00	6.50	4.74
1985	-	-	-	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-
1987	4.00	5.90	5.90	-	-	-	-	-	-	-	-	-	5.27
1988	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: No data available for Regions I to X.

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VOLUME

COMMODITY	DESCRIPTION	UNIT	1980	1981	1982	1983	1984	1985	1986	1987	1988
LIVE ANIMALS CHIEFLY FOR FOOD											
BOVINE ANIMALS	FOR BREEDING & SCIENTIFIC PURPOSES	NO	1	3	767	-	900	807	1,100	4,417	8,364
CHICKENS	LIVE, < OR = 185g., FOR BREEDING	NO	710,679	779,407	694,289	875,588	677,196	644,687	724,546	1,444,046	1,363,856
CHICKENS	LIVE, > 185g., FOR BREEDING	NO	9,315	200	10,890	9,761	76	79	3,661	3,984	68
COCKS OR ANY MALE CHICKEN	FOR BREEDING	NO	1,953	42	4	91	55	32	46	84	461
DUCKS AND GEESE	LIVE, < OR = 185g., FOR BREEDING	NO	2,202	14,620	8,180	16,686	5,882	-	-	2,000	1,350
GAME COCKS OR ANY MALE CHICKEN	FOR COCK FIGHTING	NO	1,475	1,560	809	150	19	27	28	74	200
HORSES	LIVE	NO	65	100	85	75	13	23	3	21	143
SWINE	FOR BREEDING & SCIENTIFIC PURPOSES	NO	1,228	3,007	3,216	4,763	1,006	1,432	2,947	2,069	2,694
MEAT AND MEAT PREPARATIONS											
BEEF AND VEAL	SALTED, IN BRINE, DRIED OR SMOKED	NK	617	534	498	1,316	200	111	1,310	16	1,498
CHICKENS	DRESSED, FRESH, CHILLED OR FROZEN	NK	-	-	81	68	-	53,923	2,952	27,331	4,019
CORNED BEEF	IN AIRTIGHT CONTAINERS	NK	-	16,094	711	1,478	205	-	-	705	1,174
DUCKS	DRESSED, FRESH, CHILLED OR FROZEN	NK	56,667	10,947	16,886	54,156	34,473	16,010	62,743	41,210	85,150
HAM AND SHOULDERS	DRIED, SALTED OR SMOKED	NK	3,887	3,573	4,272	1,302	1,633	2,219	3,406	4,759	25
MEAT OF BOVINE ANIMALS	FRESH, CHILLED OR FROZEN, BONELESS	NK	4,351,779	5,289,708	6,577,579	4,150,188	630,232	1,646,418	2,474,771	4,275,122	4,767,384
MEAT OF BOVINE ANIMALS	FRESH, CHILLED OR FROZEN, WITH BONE IN	NK	154,038	371,776	873,977	279,007	45,348	31,014	42,546	72,804	283,121
MEAT OF SHEEP AND GOATS	FRESH, CHILLED OR FROZEN	NK	61,577	60,668	85,585	68,302	12,372	16,054	20,009	35,183	26,004
MEAT OF SWINE	FRESH, CHILLED OR FROZEN	NK	1,361,178	931,321	985,824	680,766	230,414	454,128	403,860	1,151,156	2,462,406
PORK	IN AIRTIGHT CONTAINERS	NK	152,021	3,000	17,821	333	2,504	-	-	56,191	17,400
POULTRY LIVER	FRESH, CHILLED, FROZEEN OR SALTED	NK	2,901	714	742	4,642	280	882	1,232	1,171	200
TURKEYS	DRESSED, FRESH, CHILLED OR FROZEN	NK	10,356	21,125	48,260	11,796	4,508	4,800	9,302	21,711	6,506
DAIRY PRODUCTS											
WHEY	PRESERVED, CONCENTRATED OR SWEETENED	NK	3,954,400	5,273,596	5,853,452	5,556,507	3,974,038	1,934,425	4,037,494	4,067,781	6,031,528
MILK (OTHER THAN WHEY)	POWDER OR GRANULES, < 1.5% OR FAT	NK	70,033,335	46,425,397	65,869,336	55,933,938	44,052,138	54,271,155	51,028,197	65,721,788	58,245,841
MILK (OTHER THAN WHEY AND CREAM)	POWDER OR GRANULES, >1.5 % FAT	NK	20,335,279	25,734,009	31,089,182	27,835,134	7,073,827	16,612,234	21,443,285	34,973,678	23,496,543
BUTTERFAT, INCLUDING RAW BUTTER	ANHYDROUS MILK FAT	NK	8,019,223	8,568,000	7,507,999	8,836,879	7,919,621	5,385,692	6,180,128	6,675,375	9,263,114
CURD		NK	4,582,514	5,536,524	6,407,768	5,573,897	3,305,035	3,595,289	5,528,180	6,682,244	7,568,164
FISH AND FISH PREPARATIONS											
ANCHOVIES	PREPARED OR PRESERVED	NK	2,442	2,316	639	288	-	-	-	2,910	7,314
CUTTLEFISH AND SQUID	PREPARED OR PRESERVED	NK	1,136,354	1,646,422	2,452,410	483,940	1,159	180,608	541,456	757,387	1,492,253
SARDINES	PREPARED OR PRESERVED	NK	10,087,728	24,114,171	29,072,998	4,040,388	-	1,135	-	-	1,242,174
TUNA	FROZEN	NK	-	-	348,320	-	1,250,000	-	3,431,681	3,297,490	18,552,202
TUNA	PREPARED OR PRESERVED	NK	7,714	65	-	1,704	3,481	15,211	24,511	75,307	-
CEREALS AND CEREAL PREPARATIONS											
BARLEY	UNMILLED	NK	169,026	891,837	1,183,114	1,140,268	842,703	1,642,718	1,754,597	115,166,035	-
BEAN CURD (TAHO)		NK	11,363	20,127	40,960	43,114	17,819	37,415	29,229	40,517	80,026
COWPEAS		NK	-	116,797	36,775	1,202	43,429	13,360	36,450	37,110	30,067
DURUM WHEAT	UNMILLED	NK	-	-	-	-	-	-	-	542,000	6,257,809

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VOLUME

COMMODITY	DESCRIPTION	UNIT	1980	1981	1982	1983	1984	1985	1986	1987	1988
DURUM & SEMOLINA FLOUR		NK	6,101,751	8,203,236	9,814,061	6,742,758	704,872	8,617,068	7,832,075	9,794,329	16,211,228
FLOUR OF MAIZE		NK	2,000	2,560	7,340	9,418	5,500	-	5,000	6,500	10,300
FLOUR OF WHEAT & SPELT		NK	-	30,951	35,974	156,189	5,062,004	19,749,496	77,462,318	29,664,927	49,035,600
HYPOALLERGENIC SOY FOOD		NK	833,562	735,159	1,799,757	945,930	295,811	135,227	402,520	448,393	638,502
MACARONI, SPAGHETTI, MACARONI NOODLES		NK	131,442	238,951	1,187,667	1,534,047	81,109	1,139,620	887,364	2,970,258	3,208,420
MAIZE (CORN)	UNMILLED	NK	249,937,046	253,140,848	340,944,640	528,441,036	182,401,474	281,177,756	158,534	55,813,697	25,091,701
MALT	WHOLE OR GROUND	NK	84,105,505	83,918,872	100,987,594	125,213,925	135,170,559	77,906,767	71,725,988	135,531,665	147,856,852
MALT EXTRACT		NK	2,609,311	3,529,099	3,728,026	3,666,440	2,736,368	1,841,478	3,306,274	4,569,963	4,508,521
MALT FLOUR		NK	92,000	69,698	49,300	45,826	34,700	50	10,000	411,750	5,000
MILLET	UNMILLED	NK	30,450	64,736	158,279	83,610	23,950	352,190	133,833	81,292	207,261
NON GLUTINOUS RICE	SEMI-MILLED OR WHOLLY MILLED	NK	2,545	12,719	,	6,451	760	48,312	67,263	29,136	119,186,884
OATS	KIBBLED OR ROLLED	NK	981,987	481,966	196,039	336,788	98,000	309,941	666,070	662,327	613,142
OATS	UNMILLED	NK	1,044,022	3,692,332	3,752,905	4,167,615	1,948,086	2,353,692	2,034,056	2,635,820	2,462,450
OTHER WHEAT (INCLUDING SPELT) & MESLIN	UNMILLED	NK	785,718,958	796,428,139	924,099,764	797,170,027	766,101,186	662,710,345	989,684,354	671,321,333	1,068,521,816*
RICE		GK	2,545	12,719	91	6,451	189,717,398	538,101,712	2,056,170	32,306	119,192,384
SOYBEAN PASTE		NK	18,026	8,068	8,332	11,184	10,529	8,144	8,825	17,890	14,212
WHEAT FLOUR		NK	3,047,955	4,850,087	3,552,159	3,874,570	3,000,003	1,925,146	6,829,344	6,782,183	6,809,881
"ONION"		NK	-	2,166	13,506	11,040	-	-	9,702	21,931	43,211
"SOTANGHON"		NK	47,410	520,345	360,270	130,827	12,250	814,547	816,805	319,569	196,971

VEGETABLES AND FRUIT

ALMONDS	FRESH OR DRIED, SHELLED OR NOT	NK	2,832	2,195	8,948	6,228	341	664	3,443	2,316	43,456
ALMONDS	ROASTED	NK	2,208	4,251	3,500	1,000	-	-	6,807	204	9,742
APPLES	FRESH	GK	11,370,198	10,594,510	11,346,574	1,133,126	8,694	13,456	86,247	9,739	22,424,071
ASPARAGUS	DEHYDRATED OR EVAPORATED	GK	348	1,450	1,380	2,268	900	2,050	-	2,150	660
ASPARAGUS	PREPARED OR PRESERVED	NK	40,537	18,718	134,367	106,273	55,792	81,000	31,399	75,753	316,024
BAMBOO SPROUTS	PREPARED OR PRESERVED	NK	4,134	9,357	50,043	16,606	6,032	23,363	27,331	70,459	107,450
BEANS (RED)	DRIED	NK	433,000	619,166	509,357	466,000	423,360	302,973	60,006	37	277,581
BEANS (WHITE)	DRIED	GK	1,078,258	1,151,725	928,061	714,440	857,451	260,165	812,787	1,732,878	1,351,081
BEANS, MONGO (GREEN OR YELLOW)	DRIED	NK	200,010	250,000	-	-	-	1,048,560	11,248,180	6,890,597	8,571,145
BERRIES	FRESH	GK	88,798	15,126	4,183	12,614	411	4,614	4,716	2,242	13,885
BROCCOLI	FRESH OR CHILLED	GK	10,606	7,963	8,874	22,744	8,008	7,219	24,873	8,298	11,214
CAULIFLOWER	FRESH OR CHILLED	GK	697	497	1,237	4,362	2,737	648	3,316	143	1,191
CELERY	FRESH OR CHILLED	GK	9,081	7,797	7,799	20,917	4,168	3,600	8,622	4,291	2,570
CHERRIES	DRAINED, GLACE OR CRYSTALLIZED	NK	5,987	13,285	6,356	19,779	1,659	2,095	27,247	16,725	50,066
CHERRIES	IN BRINE OR SULPHUR WATER	NK	166,179	111,802	-	17,690	129,823	14,578	78,268	98,040	163,560
CHERRIES	IN SYRUP	NK	20,094	11,624	27,069	51,234	825	4,703	48,122	9,566	28,331
CHESTNUTS	FRESH OR DRIED, SHELLED OR NOT	NK	100,913	53,610	250,344	56,896	89	348	220	532,266	669,401
CORN	PREPARED OR PRESERVED	NK	13,408	29,072	373,216	687,671	100,488	301,048	443,380	789,962	1,300,018
GARLIC	DEHYDRATED OR EVAPORATED	GK	23,466	37,102	41,350	28,421	11,511	26,068	41,707	130,346	166,628
GRAPE JUICE		NK	6,727	46,177	162,190	186,387	7,232	119,116	80,274	146,467	95,906
GRAPES	DRIED	NK	359,559	468,706	537,726	833,927	198,730	643,459	808,267	1,113,884	1,895,748
GRAPES	FRESH	GK	384,383	326,914	226,570	140,925	1,637	7,346	6,017	47,800	2,607,172
GREEN PEAS	FROZEN	GK	326,007	290,749	400,215	268,830	28,997	213,595	378,391	539,611	645,283
JAMS		NK	11,847	7,464	8,597	29,667	4,760	20,100	36,181	16,881	36,263

*GK for 1988 only

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VOLUME

COMMODITY	DESCRIPTION	UNIT	1980	1981	1982	1983	1984	1985	1986	1987	1988
JELLIES		NK	3,882	29,871	46,863	158,850	24,143	46,159	113,685	490,476	332,266
LEMONS AND LIMES	FRESH	GK	11,888	12,303	17,662	20,021	6,674	4,896	12,448	3,697	7,967
LETTUCE	FRESH OR CHILLED	GK	49,288	53,853	33,381	74,392	14,841	5,868	2,380	3,632	1,541
MANDARINES	FRESH	GK	707	48,000	.	.	71,660	30	1,184	1,710	338,082
MARMALADES		NK	7,654	1,569	1,384	3,118	608	7,923	8,479	21,139	9,929
MUSHROOMS	DEHYDRATED OR EVAPORATED	NK	490	2,095	4,821	851	1,100	200	1,100	533	8,515
MUSHROOMS	DRIED	NK	1,013	3,768	8,481	4,628	448	1,200	1,320	8,983	1,308
MUSHROOMS	PREPARED OR PRESERVED	NK	59,560	42,567	184,222	34,753	7,372	68,145	67,415	73,404	130,820
ONIONS	DEHYDRATED OR EVAPORATED	GK	17,711	45,648	42,356	74,507	12,212	20,334	61,176	78,540	138,045
ORANGE JUICE		NK	11,719	72,903	264,448	363,384	19,462	490,439	1,052,258	975,866	899,106
ORANGES	FRESH	GK	217,539	340,713	337,262	276,856	8,043	9,748	28,544	12,072	3,144,168
PARSLEY	DEHYDRATED OR EVAPORATED	GK	.	201	200	200	184	204	244	.	1,757
PEACHES	IN SYRUP	NK	77,838	75,207	325,545	212,352	15,123	121,314	741,115	630,807	813,066
PEANUTS	ROASTED	NK	2,185	908	898	58	200	4,780	15,544	142,267	53,866
PEARS AND QUINCES	FRESH	GK	473,400	386,996	279,106	23,806	2,793	3,727	14,689	2,502	838,366
PEAS, CHICK (GARBANZOS)	DRIED	GK	353,162	571,198	366,860	515,605	401,310	246,447	279,148	315,402	482,861
PEAS, GREEN	PREPARED OR PRESERVED	NK	2,700	2,500	48 '8	16,909	1,735	1,712	2,520	10,312	10,194
PEAS, GREEN (CHICHARO)	DRIED	NK	786,280	1,324,170	1,469,123	2,790,549	818,520	2,427,268	2,325,199	4,108,619	4,092,090
PEPPER	FRESH OR CHILLED	GK	4,991	2,496	2,256	12,402	1,179	1,563	281	95	949
POTATO FLAKES		NK	178,031	25,010	89,537	119,611	15,443	37,230	41,515	98,912	237,679
POTATO FLOUR OR MEAL		NK	19,544	50,488	48,362	48,114	.	4,286	940	41,474	91,923
POTATOES	DEHYDRATED OR EVAPORATED	GK	17,760	22,545	34,568	4,080	14,144	5,879		18,370	14,912
POTATOES	FRESH	NK	.	750	33,817	3,378	.	11,703	.	.	153,947
PRUNES	DRIED	NK	4,400	24,541	46,312	55,604	.	1,145	167,904	118,474	126,115
PRUNES	IN SYRUP	NK	2,082	.	11,798	15,078	.	55	4,415	.	40,213
SEED POTATOES		NK	125,302	134,600	85,250	.	.	800	24,100	78,000	.
SOYBEANS (TAUSI)	SALTED AND FERMENTED	NK	440	4,653	17,348	7,398	8,058	7,767	7,398	12,425	19,184
SPINACH	FRESH OR CHILLED	GK	3,014	8,312	3,466	11,167	739	1,783	2,211	1,000	813
TOMATOES	PREPARED OR PRESERVED	NK	300	2,522	9,902	14,204	3,124	651,191	68,308	25,667	55,917
WALNUTS	FRESH OR DRIED, SHELLED OR NOT	NK	22,231	2,085	27,743	8,869	3,200	217	5,275	41,956	24,053
WALNUTS	ROASTED	NK	3,070	14,701	14,086	6,534	.	35	2,074	3,422	14,910
SUGAR, SUGAR PREPARATIONS AND HONEY											
CARAMEL	ACID-PROOF, MEDICINAL GRADE	NK	4,193	3,580	3,049	3,830	6,258	1,808	4,153	5,111	2,033
CARAMEL	OTHER THAN MEDICINAL	NK	1,788	1,256	4,221	4,536	1,830	3,404	2,487	8,997	9,938
CENTRIFUGAL SUGAR		NK	.	.	.	.	.	.	.	.	39,600,000
CORN SYRUP	MILK MODIFIER FOR INFANT FEEDING	NK	190,366	474,525	145,406	161,731	342,850	464,082	687,521	270,156	.
GLUCOSE	CHEMICALLY PURE	NK	532,740	1,559,542	1,741,974	3,922,821	1,162,301	3,474,857	6,276,507	7,420,436	9,494,285
GLUCOSE	COMMERCIAL	NK	11,720	5,261,845	6,289,511	7,574,525	470,967	4,539,479	5,407,177	7,064,639	3,875,640
HONEY	ARTIFICIAL	NK	33,015	94,897	170,924	117,168	13,977	772	65,766	60,205	81,108
NATURAL HONEY		NK	2,964	22,563	35,026	30,296	604	320	26,153	16,452	69,484
REFINED SUGARS	SOLID	NK	1,283	827	1,367	304	652	118	85,518	25,973,275	26,277,023
COFFEE, TEA, COCOA AND SPICES											
ANISE SEEDS	GROUND, IN BULK CONTAINERS	NK	90	204	1,172	.	1,011	229	1,191	221	1,492
ANISE SEEDS	UNGROUND, IN BULK CONTAINERS	NK	20,368	35,280	14,789	6,000	12,000	19,201	9,568	18,425	17,623

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VOLUME

COMMODITY	DESCRIPTION	UNIT	1980	1981	1982	1983	1984	1985	1986	1987	1988
OTHER FERMENTED BEVERAGES		LITER	22,311	12,404	14,486	14,856	4,500	2,725	12,443	26,400	24,832
TOBACCO AND TOBACCO MANUFACTURES											
TOBACCO MANUFACTURES	MANUFACTURES	NK	283,832	266,462	292,501	343,431	166,018	385,584	158,656	207,545	900,616*
TOBACCO, UNMANUFACTURED & REFUSE	UNMANUFACTURED, REFUSE	NK	13,936,097	15,308,905	12,866,255	13,156,346	8,268,222	12,257,781	12,720,490	19,247,978	21,917,279
HIDES, SKINS AND FURKINS											
REPTILE AND AQUATIC ANIMAL SKINS		NK	199	4,716	776	922	1,915	1,802	3,125	1,333	3,215
SWINE HIDES AND SKINS	INCLUDING PECCARY	NK	-	-	-	166,014	289,998	602,328	259,106	406,026	990,359
OIL SEEDS AND OLEAGINOUS FRUIT											
SESAME SEEDS	FOR FOOD	NK	613	8,008	12,511	9,270	16,232	96,919	224,060	156,548	161,148
SESAME SEEDS	NOT FOR FOOD	NK	2,502	454	-	-	-	-	-	10,905	54,560
SOYA BEANS	EXCLUDING FLOURS AND MEALS	NK	11,938,212	200,000	31,424,146	30,655,276	-	22,997,038	5,923,049	9,463,844	24,169,191
SUNFLOWER SEEDS	EXCLUDING FLOURS AND MEALS	NK	29,495	20,781	4,860	11,725	20,220	84,164	136,660	231,671	223,226
NATURAL RUBBER											
NATURAL RUBBER		NK	41,550	73,125	149,575	311,575	2,467	7,700	182,247	67,840	84,028
NATURAL RUBBER LATEX		NK	8,518	25,756	10,497	196,436	17,750	19,475	14,583	36,900	320,104
CORK AND WOOD											
SAWLOGS AND VENEER LOGS	IN THE ROUGH	CUDM	7,784,560	7,881,860	-	85,329	-	3,066	-	58,962	4,965,000
TEXTILE FIBERS - NATURAL											
COTTON		NK	30,136,829	20,353,407	14,232,532	21,487,826	16,145,112	20,961,197	42,606,203	49,941,846	37,722,816
COTTON YARN		NK	753,984	159,431	87,251	167,730	250,371	280,218	973,018	1,383,417	2,445,019
JUTE & OTHER TEXTILE BAST FIBERS	RAW OR PROCESSED BUT NOT SPUN	NK	2,498,975	3,212,133	1,709,294	197,629	1,020,170	491,640	1,299,945	-	499,875*
RAMIE YARN		NK	-	-	-	-	-	4,351	21,835	340,200	114,217
SILK		NK	7,150	749	590	2,780	1,923	725	1,199	556	14,928*
CRUDE ANIMAL & VEGETABLE MATERIALS											
MELON SEEDS	FOR PROPAGATION	NK	14,995	27,098	145	10,677	1,360	226	1,310	1,129	544
ONION AND CABBAGE SEEDS	FOR PLANTING	NK	31,220	38,047	103,162	37,642	43,063	48,660	39,363	49,017	56,575
RATTAN SPLIT		NK	45,078	41,840	106,766	138,797	243,552	344,364	642,382	778,678	590,365
SEAWEEDS	DRIED	GK	1,363	2,390	2,206	763	146	348	82,707	162,166	420,571
WATERMELON SEEDS	FOR PLANTING	NK	54,548	16,015	140,743	39,751	4,613	8,396	19,519	24,201	29,094
ANIMAL OILS AND FATS											

*GK for 1988 only

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VALUE (FOB $'000)

COMMODITY	DESCRIPTION	1980	1981	1982	1983	1984	1985	1986	1987	1988
LIVE ANIMALS CHIEFLY FOR FOOD										
BOVINE ANIMALS	FOR BREEDING & SCIENTIFIC PURPOSES	1	11	467	.	761	621	1,009	1,406	2,448
CHICKENS	LIVE, < OR = 185g., FOR BREEDING	1,977	2,361	2,212	2,479	2,267	2,251	2,384	3,309	3,813
CHICKENS	LIVE, > 185g., FOR BREEDING	17	11	42	22	5	6	34	67	18
COCKS OR ANY MALE CHICKEN	FOR BREEDING	21	3	.	7	5	4	4	8	43
DUCKS AND GEESE	LIVE, < OR = 185g., FOR BREEDING	32	31	30	40	1	.	.	.	2,591
GAME COCKS OR ANY MALE CHICKEN	FOR COCK FIGHTING	117	142	64	17	2	2	3	6	28
HORSES	LIVE	237	292	122	93	5	44	1	78	226
SWINE	FOR BREEDING & SCIENTIFIC PURPOSES	729	725	930	1,412	311	809	1,228	1,145	1,531
MEAT AND MEAT PREPARATIONS										
BEEF AND VEAL	SALTED, IN BRINE, DRIED OR SMOKED	11	4	4	14	1	2	16	.	3
CHICKENS	DRESSED, FRESH, CHILLED OR FROZEN	.	.	.	.	.	98	6	60	63
CORNED BEEF	IN AIRTIGHT CONTAINERS	.	43	4	5	1	.	.	2	5
DUCKS	DRESSED, FRESH, CHILLED OR FROZEN	73	33	46	152	57	41	109	64	123
HAM AND SHOULDERS	DRIED, SALTED OR SMOKED	45	19	12	11	12	4	15	9	.
MEAT OF BOVINE ANIMALS	FRESH, CHILLED OR FROZEN, BONELESS	9,005	12,244	14,691	9,660	1,556	2,607	2,528	5,046	6,556
MEAT OF BOVINE ANIMALS	FRESH, CHILLED OR FROZEN, WITH BONE IN	685	1,344	2,411	1,192	268	205	308	326	929
MEAT OF SHEEP AND GOATS	FRESH, CHILLED OR FROZEN	341	259	276	212	63	62	123	79	84
MEAT OF SWINE	FRESH , CHILLED OR FROZEN	914	784	958	585	167	281	309	890	1,409
PORK	IN AIRTIGHT CONTAINERS	100	3	3	.	2	.	.	70	9
POULTRY LIVER	FRESH, CHILLED, FROZEEN OR SALTED	77	24	31	62	12	22	24	22	4
TURKEYS	DRESSED, FRESH, CHILLED OR FROZEN	48	107	104	60	25	20	30	24	14
DAIRY PRODUCTS										
WHEY	PRESERVED, CONCENTRATED OR SWEETENED	1,756	2,922	2,869	3,088	1,021	2,900	2,648	3,213	1
MILK (OTHER THAN WHEY)	POWDER OR GRANULES <1.5% FAT	54,564	48,602	46,867	33,995	35,242	36,272	2,735	69,414	19
MILK (OTHER THAN WHEY) AND CREAM	POWDER OR GRANULES, >1.5% FAT	34,141	52,046	50,783	10,772	22,897	35,507	54,480	55,839	143
BUTTERFAT, INCLUDING RAW BUTTER	ANHYDROUS MILK FAT	13,027	19,515	17,078	13,453	7,762	7,420	7,876	11,614	.
CURD		6,436	8,786	7,979	4,004	3,781	5,592	7,540	10,000	1,118
FISH AND FISH PREPARATIONS										
ANCHOVIES	PREPARED OR PRESERVED	3	3	7	279	.	.	.	8	12
CUTTLEFISH AND SQUID	PREPARED OR PRESERVED	938	1,644	2,565	653	.	162	577	727	1,435
SARDINES	PREPARED OR PRESERVED	9,913	23,139	29,600	4,027	.	3	.	.	995
TUNA	FROZEN	.	.	253	.	818	.	2,245	1,862	11,389
TUNA	PREPARED OR PRESERVED	23	.	.	4	4	34	54	134	.
CEREALS AND CEREAL PREPARATIONS										
BARLEY	UNMILLED	34	201	206	178	114	161	173	7,138	.
BEAN CURD (TAHO)		5	11	14	14	5	11	7	10	18
CORN SEED		.	88	28	3	16	6	7	19	8

VALUE (FOB $'000)

COMMODITY	DESCRIPTION	1980	1981	1982	1983	1984	1985	1986	1987	1988
DURUM WHEAT	UNMILLED	.	.	.	.	.	.	.	70	777
DURUM & SEMOLINA FLOUR		1,801	2,079	2,561	1,739	208	1,620	2,091	2,468	3,942
FLOUR OF MAIZE		14	10	47	32	41	.	38	55	108
FLOUR OF WHEAT & SPELT		.	10	15	88	1,701	3,502	15,252	4,136	7,990
HYPOALLERGENIC SOY FOOD		1,430	2,168	2,438	1,712	709	397	1,194	1,117	1,700
MACARONI, SPAGHETTI, MACARONI NOODLES		65	291	1,279	1,883	104	1,447	898	2,346	1,876
MAIZE (CORN)	UNMILLED	35,117	42,000	42,669	70,747	28,859	33,466	59	5,420	2,560
MALT	WHOLE OR GROUND	21,379	24,771	28,639	32,070	36,564	17,941	13,609	19,791	27,025
MALT EXTRACT		1,614	2,572	3,418	2,899	2,173	904	2,109	3,070	2,950
MALT FLOUR		54	53	37	33	28	.	6	60	3
MILLET	UNMILLED	8	16	38	12	5	58	19	12	32
NON-GLUTINOUS RICE	SEMI-MILLED OR WHOLLY MILLED	4	12	.	10	1	17	27	10	36,785
OATS	HIBBLED OR ROLLED	298	173	59	95	18	169	528	493	487
OATS	UNMILLED	644	810	641	610	253	332	216	280	284
OTHER WHEAT (INCLUDING SPELT) & MESLIN	UNMILLED	148,564	150,775	157,668	134,579	131,098	106,086	129,017	81,999	135,234
RICE	NON-GLUTINOUS	4	12	90	10	42,322	110,398	312	12	36,785
SOYBEAN PASTE		32	1	4	8	7	3	3	8	5
WHEAT FLOUR		838	1,250	739	781	844	357	926	1,019	1,176
"UNION"		.	1	3	3	.	.	4	6	13
"SOLANGION"		42	711	392	135	19	799	884	397	157
VEGETABLES AND FRUIT										
ALMONDS	FRESH OR DRIED, SHELLED OR NOT	16	7	25	15	1	3	9	12	28
ALMONDS	ROASTED	14	6	13	3	.	.	19	1	4
APPLES	FRESH	2,417	2,462	2,368	391	11	16	42	10	9,141
ASPARAGUS	DEHYDRATED OR EVAPORATED	3	11	8	15	9	11	.	17	7
ASPARAGUS	PREPARED OR PRESERVED	51	16	82	49	35	108	22	27	161
BAMBOO SPROUTS	PREPARED OR PRESERVED	3	6	22	13	4	13	12	23	33
BEANS (RED)	DRIED	192	335	219	127	152	92	23	.	66
BEANS (WHITE)	DRIED	720	926	821	451	492	136	458	982	782
BEANS, MONGO (GREEN OR YELLOW)	DRIED	39	59	.	.	.	153	1,830	1,340	1,270
BERRIES	FRESH	88	39	28	73	1	11	7	6	33
BROCCOLI	FRESH OR CHILLED	20	14	19	40	15	10	29	10	10
CAULIFLOWER	FRESH OR CHILLED	1	1	2	8	6	1	3	.	1
CELERY	FRESH OR CHILLED	12	9	8	17	3	2	6	2	1
CHERRIES	DRAINED, GLACE OR CRYSTALLIZED	10	8	10	24	7	5	33	19	28
CHERRIES	IN BRINE OR SULPHUR WATER	634	350	.	68	228	23	233	259	401
CHERRIES	IN SYRUP	41	20	28	51	3	10	51	10	15
CHESTNUTS	FRESH OR DRIED, SHELLED OR NOT	118	68	210	47	.	1	.	338	406
CORN	PREPARED OR PRESERVED	8	8	180	434	56	175	258	415	438
GARLIC	DEHYDRATED OR EVAPORATED	55	78	72	69	32	46	70	217	330
GRAPE JUICE		9	21	83	119	5	66	47	77	54
GRAPES	DRIED	324	272	465	551	128	406	484	505	607
GRAPES	FRESH	223	176	130	56	3	13	9	38	2,171
GREEN PEAS	FROZEN	67	77	127	133	13	46	83	110	135
JAMS		25	13	5	56	6	23	32	20	28
JELLIES		8	16	11	46	7	18	28	111	70

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VALUE (FOB $'000)

COMMODITY	DESCRIPTION	1980	1981	1982	1983	1984	1985	1986	1987	1988
LEMONS AND LIMES	FRESH	15	11	11	14	5	5	10	3	5
LETTUCE	FRESH OR CHILLED	88	82	52	108	164	6	2	3	1
MANDARINES	FRESH	3	18	-	-	23	-	1	1	117
MARMALADES		11	4	1	4	1	19	9	35	8
MUSHROOMS	DEHYDRATED OR EVAPORATED	9	34	91	9	30	3	22	13	21
MUSHROOMS	DRIED	10	14	2	30	3	9	7	28	21
MUSHROOMS	PREPARED OR PRESERVED	32	34	88	51	8	75	51	47	47
ONIONS	DEHYDRATED OR EVAPORATED	49	91	132	179	32	45	131	173	206
ORANGE JUICE		18	91	337	477	51	304	421	302	226
ORANGES	FRESH	80	95	107	86	5	7	17	7	1,471
PARSLEY	DEHYDRATED OR EVAPORATED	-	1	-	1	1	1	2	-	9
PEACHES	IN SYRUP	25	27	159	86	7	44	346	259	335
PEANUTS	ROASTED	4	1	1	-	-	1	45	39	15
PEARS AND QUINCES	FRESH	113	112	72	10	2	3	9	2	200
PEAS, CHICK (GARBANZOS)	DRIED	257	449	341	334	51	159	224	173	228
PEAS, GREEN	PREPARED OR PRESERVED	3	3	2	10	-	1	1	5	6
PEAS, GREEN (CHICHARO)	DRIED	257	432	491	880	237	670	572	821	839
PEPPER	FRESH OR CHILLED	8	4	7	27	2	3	-	-	1
POTATO FLAKES		82	32	122	186	22	26	21	88	155
POTATO FLOUR OR MEAL		11	40	38	29	-	1	-	38	10
POTATOES	DEHYDRATED OR EVAPORATED	19	35	50	4	3	1	-	5	15
POTATOES	FRESH	-	-	38	5	-	15	-	-	30
PRUNES	DRIED	2	10	17	19	-	1	139	93	63
PRUNES	IN SYRUP	2	-	5	6	-	-	3	-	21
SEED POTATOES		46	59	29	-	-	-	10	39	-
SOYBEANS (TAUSI)	SALTED AND FERMENTED	-	2	5	3	5	4	3	4	7
SPINACH	FRESH OR CHILLED	7	13	6	18	1	2	2	1	1
TOMATOES	PREPARED OR PRESERVED	1	1	4	8	2	423	56	11	23
WALNUTS	FRESH OR DRIED, SHELLED OR NOT	16	2	21	13	11	1	8	23	48
WALNUTS	ROASTED	5	9	10	3	-	-	3	2	9
SUGAR, SUGAR PREPARATIONS AND HONEY										
CARAMEL	ACID-PROOF, MEDICINAL GRADE	6	4	3	4	9	3	9	9	6
CARAMEL	OTHER THAN MEDICINAL	4	4	8	7	4	4	3	9	14
CENTRIFUGAL SUGAR		-	-	-	-	-	-	-	-	8,305
CORN SYRUP	MILK MODIFIER FOR INFANT FEEDING	115	347	115	73	164	219	289	726	-
GLUCOSE	CHEMICALLY PURE	423	849	709	1,289	753	761	1,402	1,752	1,991
GLUCOSE	COMMERCIAL	8	1,566	1,415	1,415	104	684	940	826	511
HONEY	ARTIFICIAL	43	127	198	86	19	1	52	46	64
NATURAL HONEY		5	12	33	21	3	-	13	7	47
REFINED SUGARS	SOLID	3	4	4	1	1	-	22	5,435	5,223
COFFEE, TEA, COCOA AND SPICES										
ANISE SEEDS	GROUND, IN BULK CONTAINERS	-	1	2	-	3	1	1	-	4
ANISE SEEDS	UNGROUND, IN BULK CONTAINERS	13	31	12	6	4	8	4	9	7

IMPORTS OF SELECTED AGRICULTURAL AND RELATED PRODUCTS: 1980 TO 1988

VALUE (FOB $'000)

COMMODITY	DESCRIPTION	1980	1981	1982	1983	1984	1985	1986	1987	1988
OTHER FERMENTED BEVERAGES		32	14	13	13	3	2	16	27	17
TOBACCO AND TOBACCO MANUFACTURES										
TOBACCO MANUFACTURES	MANUFACTURES	2,497	2,902	3,682	4,951	2,628	5,990	2,440	2,469	6,077
TOBACCO, UNMANUFACTURED & REFUSE	UNMANUFACTURED, REFUSE	33,261	39,162	49,477	53,367	26,164	59,167	63,457	91,921	71,982
HIDES, SKINS AND FURSKINS										
REPTILE AND AQUATIC ANIMAL SKINS		8	101	17	20	24	18	41	26	26
SWINE HIDES AND SKINS		-	-	-	114	197	259	162	223	666
OIL SEEDS AND OLEAGINOUS FRUIT										
SESAME SEEDS	FOR FOOD	1	7	3	7	3	22	47	23	22
SESAME SEEDS	NOT FOR FOOD	1	1	-	-	-	-	-	2	6
SOYA BEANS	EXCLUDING FLOURS AND MEALS	2,815	79	7,796	7,393	-	5,513	1,235	1,993	5,349
SUNFLOWER SEEDS	EXCLUDING FLOURS AND MEALS	15	4	1	5	5	17	29	49	52
NATURAL RUBBER										
NATURAL RUBBER		83	64	110	287	10	21	159	83	176
NATURAL RUBBER LATEX		8	20	17	146	17	13	10	31	666
CORK AND WOOD										
SAWLOGS AND VENEER LOGS	IN THE ROUGH	289	298	-	23	-	11	-	33	245
TEXTILE FIBERS - NATURAL										
COTTON		43,975	33,581	19,919	29,171	19,814	25,093	32,709	48,114	71,550
COTTON YARN		1,771	623	459	750	1,005	1,024	1,696	4,191	5,220
JUTE & OTHER TEXTILE BAST FIBERS	RAW OR PROCESSED BUT NOT SPUN	709	810	320	39	347	166	331	-	120
RAMIE YARN		-	-	-	-	-	27	136	2,443	592
SILK		28	18	17	74	82	13	24	15	5
CRUDE ANIMAL & VEGETABLE MATERIALS										
MELON SEEDS	FOR PROPAGATION	-	18	2	6	2	2	12	12	6
ONION AND CABBAGE SEEDS	FOR PLANTING	725	1,016	1,207	606	342	667	919	1,111	1,148
RATTAN SPLIT		121	134	351	328	673	701	1,316	2,091	1,653
SEAWEEDS	DRIED	2	1	8	1	2	-	8	19	31
WATERMELON SEEDS	FOR PLANTING	135	69	171	127	43	78	155	99	246
ANIMAL OILS AND FATS										
FISH LIVER OILS		67	31	34	8	9	16	13	83	28

CHAPTER V

Location and Site

CHAP. V LOCATION AND SITE

As you can see from the enclosed maps, the building has already been identified.

1. Location

The factory will be located within the General Milling Corporation Complex in Mactan Island, Province of Cebu. The complex is extended on 14 ha which includes several operational plants.

2. Existing Access

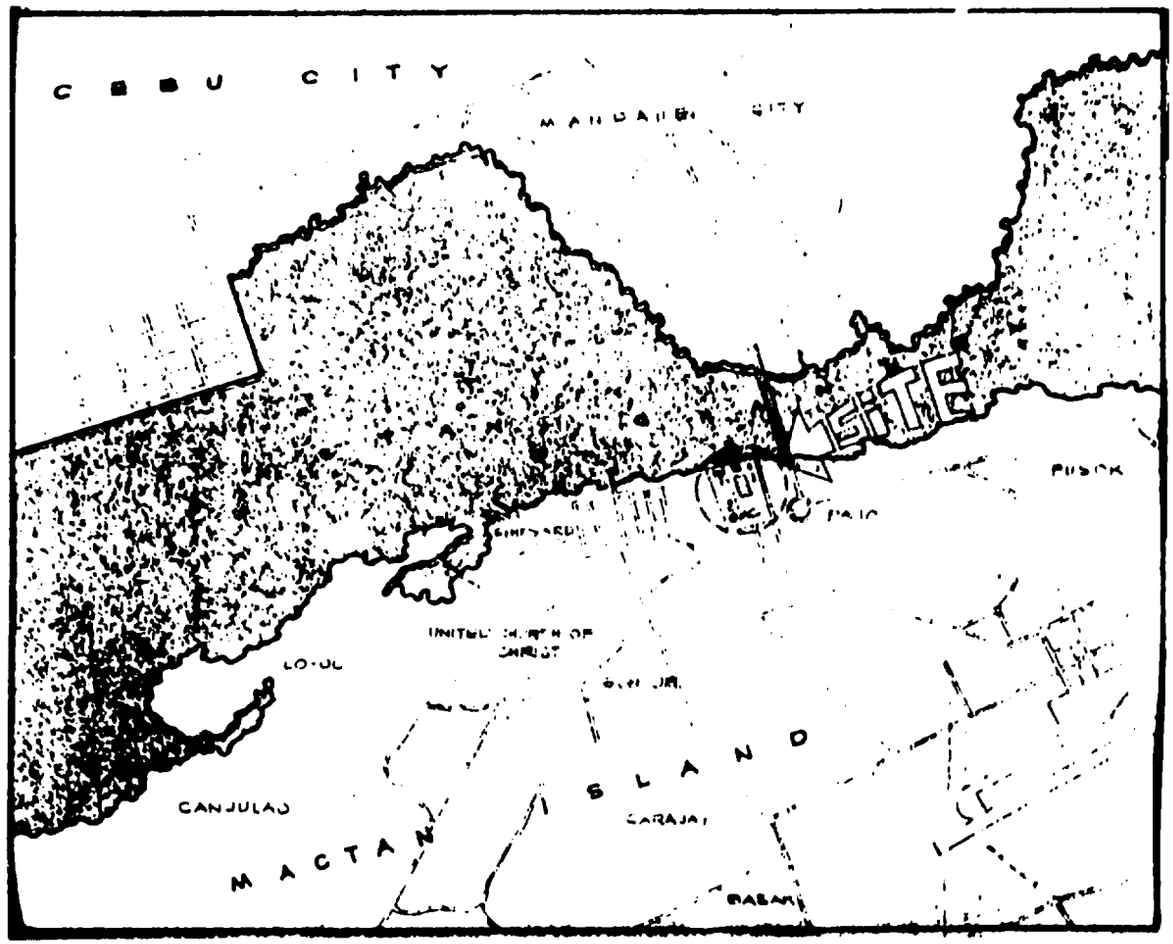
There is an access road to the complex (Quezon Blvd) and a wharf where all goods transported by sea can be landed.
The complex has a developed road network.

3. Existing services

Water and electricity are available on the complex. In addition there are generators, good water tanks, a laboratory, and maintenance facilities for the electrical and mechanical sectors.

CHAPTER V

MAPS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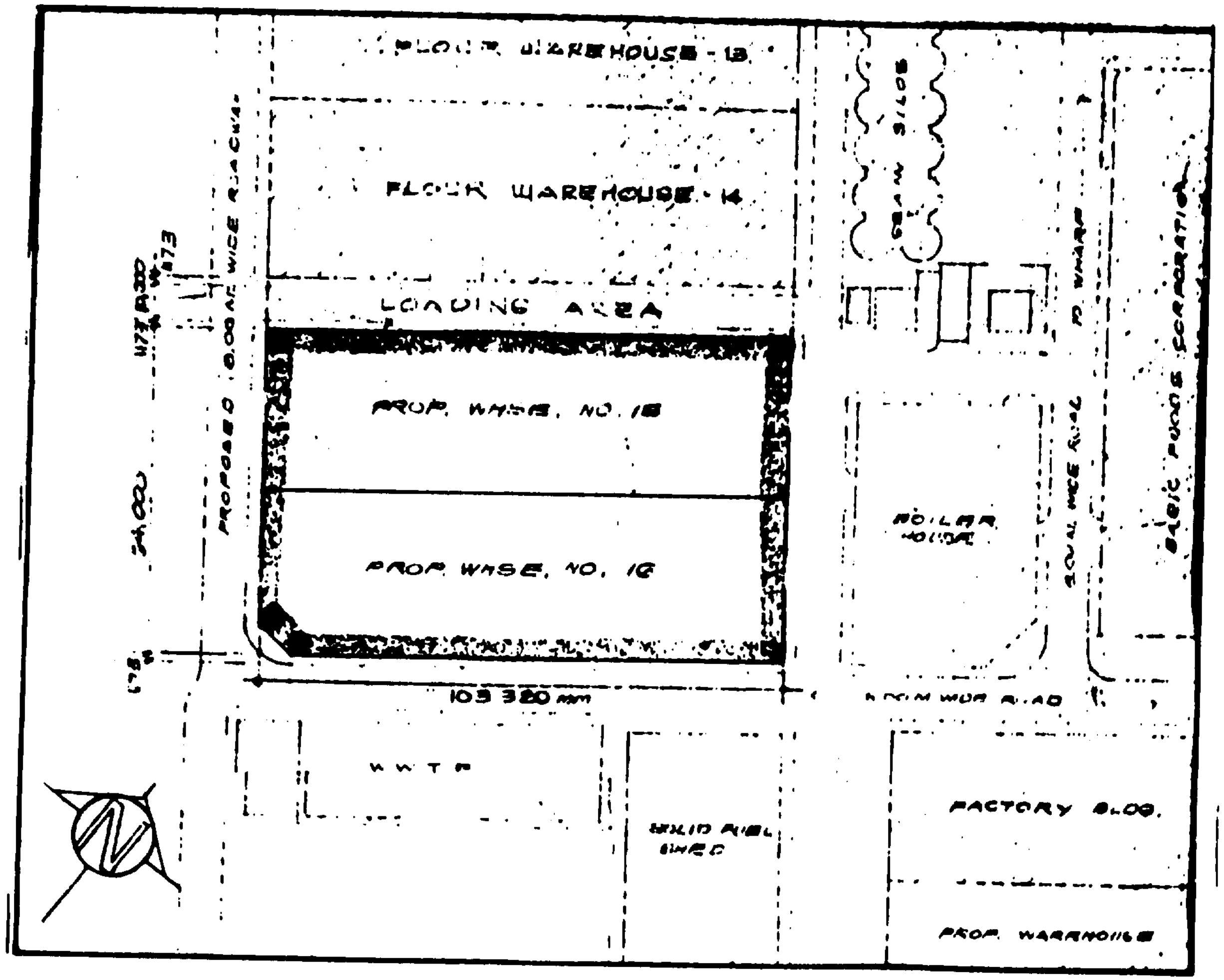

FLOUR WAREHOUSE - 13
FLOUR WAREHOUSE - 14
LOADING AREA
PROP. WHSE. NO. 15
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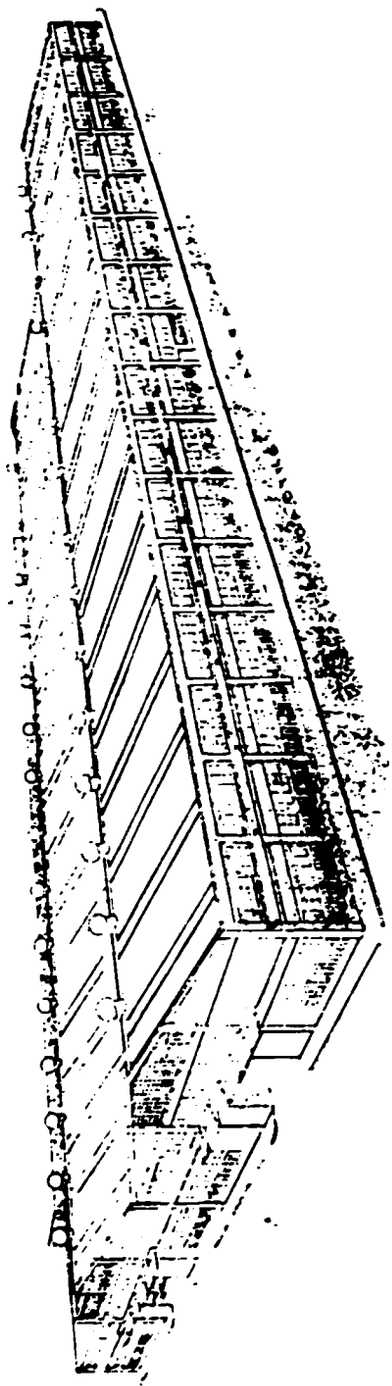
BOILER HOUSE
BASIC FOODS CORPORATION
103 320 mm
W.W.T.P.
FACTORY BLDG.
PROP. WAREHOUSE



CHAPTER VI

Project Engineering

CHAP. VI PROJECT ENGINEERING

VI.1 Selected technologies and Process Flow

VI.1.1 Alternative technologies for precooked weaning food

There are two alternatives for PWF, drum drying and extrusion cooking both are used commercially for weaning food production. Both are equally effective in producing products of adequate quality although difficulties have been experienced with drum drying, particularly at the pre-heating stage. In the production of baby foods, it is very important to gelatinize the starchy components of the cereal base material, otherwise they provoke digestive problems such as diarrhoea among the infants who will consume them. The term "gelatinization of starch" indicates the process, whereby starch in granular and paracrystalline structure swells and transforms in a continuous amorphous phase in the presence of heat and water.
The principal properties of these types of product include:

1. absence of birifringence in singular starch granules;
2. rapid and high reydratation capacity when mixed with cold water or milk.
3. high cold paste viscosity and low hot paste viscosity;
4. higher susceptibility to enzymatic digestion, and therefore, improved digestibility.

Cooking extrusion is regarded as the best route since it is a versatile process and can be used for the product diversification, eg for manufacture of breakfast cereals, snacks and rusks, as we'll explain in the next paragraph.

VI.1.2 Alternative te ogies for infant shaped cereals.

The most common technology used for the production of shaped breakfast cereals is cooking-extrusion, applied in this field with two different philosophies, leading to direct expanded breakfast cereals or to pellets breakfast cereals to be expanded by hot-air toasting.
The first one is characterized by a single step of extrusion, made by "high-shear" extruders and natural expansion due to the differential of pressure between the barrel and the external ambient.
The second one is made by two steps of extrusion, through "low-shear" extruders and following drying and toasting stages.

VI.1.3 Drum drying

Drum drying is the most commonly used technology for pregelatinized flours and starches and produced according to the following sequence of operations:

1. Metering of the powdered raw materials and water into a mixing tank or sometimes a cooking kettle. Solid content may be as high as 44% in the paste;

2.continuous mixing of the ingredients in order to obtain a homogeneous slurry;
3.spreading of the slurry in a thin film onto the external surface of a roll or a pair of rolls internally heated by steam at a pressure of up to 10 bars;
4.scraping of the dried film to obtain the product in the flake form;
5.grinding of the dry flakes to the required particle size.

The process is simple and straightforward in theory, but it becomes unpredictable and difficult to obtain a product with constant quality in practice. Disuniformity of the film thickness and its distribution on the roll surface could easily result in an inconsistency in product quality.
A slight roll elastic deformation can modify the uniformity of distribution, however increasing the wall thickness to off-set deformation is not profitable due to the reduction of the overall heat transfer coefficient as well as an increase in the energy cost.
Furthermore, the knives or scrapers are subject to wear and must be resharped from time to time and carefully set to scrape the rolls without leaving a dry solid residue. Moreover, maintenance becomes heavy and expensive particularly when the rolls have to be rectified.
Energy costs must be also taken into consideration since the fed slurries are normally reported to include only about 44% solids. This means that drying to an assumed moisture content of 8% involves the evaporation of 1kg of water per kg of product.

VI.1.4 Extrusion-cooking

a) High-shear cooking-extrusion

This process has the disadvantage of a higher mechanical shear which could damage the molecular structure of starch been the material processed at low moisture and high screw speed. These processing conditions stress the original structure much more than the ones applied in low shear extruders giving as result a lower viscosity in cold paste dispersions due to an increase of cold water solubles and the decrease of water-holding capacity for PWF, and a lower bulk-density with a worse milk resistance for shaped breakfast cereals.
Process characteristics are the following:

1) continuous metering of flours or starches and water directly in the extruder barrel; solids content is about 80-88%;
2) starch gelatinization (and partial dextrinization) along the extruder barrel; being the screw speed around 300 R.P.M. also wear becomes an important factor;
3) direct expansion of the product out of the die and immediate cutting;
4) grinding of the pieces into fine flours for PWF production, or flavouring in a drum for shaped breakfast cereals.

b) Low shear extrusion-cooking

Low shear extrusion-cooking technology, due to the versatility of extruders in handling a wide variety of raw materials capable of producing a myriad of products, with maximum cost effectiveness, have been among the first choice of producers aiming to satisfy this need for raw material transformation. Extrusion cooking has long been considered the best alternative to drum-drying due to the advantages already mentioned. The process for the pregelatinisation of starches basically includes the following steps:

1. Continuous metering of flours or starches and water into the mixing trough of the extruder. Solids content may be as high as 60-70%;
2. starch gelatinisation along the extruder barrel in very "mild" conditions, with a screw speed of 80-100 R.P.M.;
3. cutting of the extrudates into strips to increase surface/volume ratio;
4. drying of the extrudates to the required moisture content;
5. grinding of the dry extrudates to the required particle size.

Fig. 1 and 2 illustrates a continuous processing flow diagram for the production of pregelatinized flours/starches by extrusion cooking.
The process is continuous and can be reliably controlled from an electric control panel at every stage keeping the process parameters within a pre-set range without any need for mechanical adjustment.

Energy costs are relatively lower since the feed includes up to 70% solids which means that drying to a final moisture content of about 12% would involve the evaporation of only about 0.367kg of water per kg of product.

The low shear extrusion-cooking technology has been successfully applied to the production of food items such as pasta goods, pellet snacks, reformed chips, laminated snacks, and breakfast cereals. Particularly, in the application of the low shear extrusion-cooking for shaped breakfast cereals, the process scheme is the following:

1) continuous metering of flours or starches and water, with a solid content of 65-70%;
2) "mild" gelatinization of the starch through the cooker-extruder;
3) transfer of the gelatinized product to a former-extruder;
4) cutting of the well-shaped product out of a die;
5) pre-drying and drying to a final moisture content of about 10%;
6) expansion of the pellets in a hot-air oven.

The so obtained breakfast cereals are characterized by a very well refined shape, a porous crunchy texture and a rather low bulk density. The retention of crispiness in milk is quite good.

VI.1.5 PAVAN MAPIMPIANTI Experience

Pavan Mapimpianti, with its new generation of single screw extruders has realised projects in many parts of the world, with the aim of utilising locally available raw materials and at the same time producing highly competitive as well as nutritionally balanced products.

An example of this is the joint project between the Istituto Nazionale della Nutrizione (Italy) and the Escuela Politecnica del Litoral, Guayaquil (Ecuador), involving the production and transformation of banana flour and subsequent extrusion of the composite flour mixture to produce snack foods, pasta products, and instant flours for infant food using a Pavan Mapimpianti extruder.

Other examples are the baby food plants installed in Nigeria and China utilising local corn, rice and soybean flour as the main ingredients. Soybean flours as a protein source are particularly important in case of lactose intolerance.

VI.2. Choice motivation

Thanks to what said in the previous paragraphes, GMC management has found in Pavan Mapimpianti the ideal partner for developing the project under study.

As a matter of fact following points came out:

- great versatility of low shear extruders;
- lower investment costs in machinery and equipmnet as well as auxiliary plants in comparison with other production systems (drum-drying based line);
- lower operational costs in comparison with drum drying technology;
- lower maintenance requirements;
- good preservation of the nutritional values in the final products;
- high process sanitation;
- good quality of the finished products;
- perfect shape of the cereals;
- great experience of Pavan Mapimpianti in this specific sector.

VI.2.1 Technical characteristics of the "G" extruder

The Pavan Mapimpianti new generation single screw cooker extruder has been designed to take into consideration the requirements of cereal flours and starches, that is to say, careful and even moisturizing/conditioning along with the mechanical over-stressing of swollen starch granules during extrusion.

In the standard extruder configuration, the moisturised dough rests in the mixing vessel as long as it is required for the water to diffuse evenly with the flour/starch and to start the swelling process of the starch granules. At the vessel outlet, the dough falls into an opening over a variable speed forced-feeding screw placed at a right angle with the main screw, making it possible for the operator to vary the capacity, while keeping the speed of the main screw and residence times.

The main screw is housed inside a multiple staged, independently thermoregulated fluted barrel. It can have different profiles, that is monostage with a conical cone and constant flights or multistages with a conical or cylindrical cone with differentiated screw profiles, depending on the intensity of treatment required by the process.

These modular stages can be assembled on the screw shaft in various combinations. At their ends restriction rings are supplied in two halves for easier replacement.

This special feature reduces the screw wear which in this case affects only small elements that can be periodically replaced at low cost.

VI.2.3. Operating parameters

During the operation, the G cooker extruder operated mainly in the field of the so called low internal shear, that is, with the screw speed range between 80 and 100rpm, and moisture content (M) from 30-40% depending on the type of raw material being processed.

In this case, both the relatively higher moisture content and lower screw rotational speed keep the shear stress imparted on the dough at low values. The temperature profile for each raw material can be set to optimum values obtained from previous tests by following the extent starch gelatinisation of the extrudates by both microscopic and spectrophotometric analysis.

The temperature profile along the barrel can be carefully controlled and the heat generation by internal shear is lower than in high shear extruders. Furthermore, at each stage it is possible to introduce or remove heat by conduction through a jacketed barrel. Each jacket compries both electrical heating resistances and a water cooling circuit.

VI.2.4 Results obtained on various raw materials

Fig. 3 illustrates the viscosity behaviour of different starches both in their crude and pregelatinized state.
Fig 4 illustrates the following viscosity behaviour:

- pregelatinised corn starch by extrusion-cooking and drum drying.

Apart from these starches, production tests using a wide range of flours such as sorghum, millet, rice-soy, banana and cassava were also conducted obtaining good results as shown in Fig. 5.

Microbial destruction as well as the deactivation of antinutritional factors such as urease and trypsin inhibitors were investigated especially with mixtures containing soybean flours , with the results illustrated.

Table 1: microbial destruction

Table 2: anti nutritional enzyme deactivation.

The nutritional aspect, particularly the amino acid profile modifications and available lysine were also analysed which gave very acceptable results as illustrated below.

Table 3: Amino acid profile.

A baby food industrially produced with the indicated equipment with a formulation based on maize-rice-soy-bean flour was extruded for the pregelatinization and subsequently mixed with sugar, milk powder, oil, minerals and vitamins was tested with albino rats for the in-vivo analysis with results illustrated in tables 4,5 and 6.

In addition to the discussed use for starches and flours precooking, the G extruder is used as basic equipment also for production of snack food, breakfast cereals, and non traditional pasta products, utilising locally grown and available raw materials and respecting the norms for this type of products from a hygienic and nutritional point of view. The wide possibilities this technology offer will help industrialized and developing countries to satisfy their needs and contribute to solve some of their feeding problems.

VI.3 Process flow description

A) Precooked Weaning Food (PWF)

The production process can be divided into 2 parties. The first concerns the transformation of crude flours into precooked ones, while the second foresees the addition of other ingredients such as powder milk, sugar, vitamins, flavours.
The first steps utilizes cereals flours, eventually with the addition of leguminoses flours to increase the proteic content. The dried raw materials are mixed in a FM mixer and then fed in a continuous and automatic way to the gelatinizer extruder . At the extruder inlet the blend is dosed in a prefixed proportion with the required water quantity for the dough making.
The dough making phase grants an appropriate flour imbibition for the obtaining of a perfect cooking.
The cooking is made through the heat generated by the friction of the product compressed by the screw and by the one given by the cylinder's jackets.
A special heated head at the end of the cylinder allows the extrusion of the expanded and soft product in continuous strips which are cut into little pieces by a cutter situated at a certain distance from the head.
The product is then conveyed to the dryer section where it is dried in hot air at about 250-C for a brief period, in order to maintain the microporous structure obtained by the extrusion.
After cooling the product is ground till reaching a granulometry of about 400 and then stored in silos, as to be ready for the second phase.

The second process step is made with a first batch weighing, followed by a mixing steps during which further liquid components can be added (oil, vitamins, etc.).
The powder milk and the precooked flour are dosed directly by the storage bins. The sugar is instead ground immediately before mixing and stirred continuously during the dosing phase.
Packaging is made with screw volumetric dosers which dose the product inside the forming tube of the vertical packaging machine for thermosealable film.

B) Shaped cereals

The dried raw materials, cereals flours like rice, wheat, oat and buckwheat, are mixed according to the required quantities with sugar, salt and malt extract, in the FM mixer, from where they are continuously fed in the gelatinizer extruder.
At the extruder inlet they are dosed in a prefixed proportion with the required water quantity for the dough.
The dough making phase allows water absorption by the flours to obtain a more homogenous cooking.
Cooking is made during conveying in the screw extruder thanks to the heat generated by the product friction between screw and cylinder and cylinder jackets heating.
The low rotation speed of the cooking screw and the homogenous water distribution in the dough grant a cooking without excessive damages to the starch, guaranty for a better organoleptique quality of the finished product.

The cooked dough is fed in form of little chops at the F extruder where it is cooled with air and recompressed to be shaped.
The final figure is obtained thanks to a die that can be easily substituted, allowing in this way a good variety of products.
The cutting of the product is made directly on the die surface.
After forming the product, solid and compact, is dried in two following phases under moisture and temperature conditions controlled till at a moisture level of 10-11%.
At the dryer outlet the product can be stored also for long periods, thanks to its firmness.
The final aspect to the product is given by the expansion and toasting phase.
During a brief transportation in an air current at high temperature, the water contained in the product instantly evaporates, causing an expansion of the product which becomes in this way light and crumbly.
The regulation of the residence time at high temperature gives to the product the typical toasted taste.

VI.4 Production plant

Following the processes description and taking into consideration all the unit operations involved in both processes, a scheme of production plant can be released.(see tab. 7).

From this scheme it is evident that most part of the equipment can be used for both productions, suggesting that the production plant can be a single one and organized in sections that can operate separately.

VI.5 Production organization and plant capacity

The main variations that will influence the production timing of all the plant depend on the number of shifts worked in the baby food blending and packaging section.
From the results of market analysis and considering the possible future market demands a plant based on an extruder cooking section that can produce up to 350 kg/h of precooked flours and up to 500 kg/h of cooked dough for shaped cereals will be considered in this production organization.

Assuming one shift for baby foods blending and packaging, the production of precooked flours is run for 4 days, with 3 shifts/day.
Packaging is to be continued for the followings 9 days. This hypothesis of production organization gives an utilization of the first part of the line at 30% while the packaging section should work for all the time.
With this hypothesis the annual production of precooked weaning foods (280 days) will be of 1050 tons, while the one for shaped cereals will be of 1780 tons.
In consideration of the flexibility of the plant and equipment, it is possible to organize production according to multivarious hypothesis.

For example, if we assume 2 shifts for baby foods packaging, allowing production for 8 days before getting the storage bins full and successively continuing to packing for other 4 days.
It results that the cooking line for baby foods is utilized for about 63%.
With this hypothesis the annual production of PWF will be of 2100 tons, while the one for shaped cereals will be of 810 tons.

Considering the operational time for precooked flours production divided in equal portion between PWF1 and PWF2 the total output per year will be around 1050 tons (considering one shift for packaging) divided in 520 tons for PWF1 and 530 tons of PWF2.
The total production of shaped cereals will be 1780 tons divided into 890 tons of "Multicereal" type and 890 tons of "High protein" type.
Obviously this is one hypothesis of time shearing for production. Other solutions are possible (e.g. changing the ratio between PWF1 and PWF2) this will cause slight changes in the total annual output.

Calculations for annual outputs have been made as follows:

- All days for three shifts have been calculated for 23 hours operation.

- All days for one shift operation have been calculated for 7 hours effective operation.

- Total labour day has been calculated 280 days per year.

VI.6 Mass balance

For the requirements of main raw materials considered in the chapter "Raw materials and input" the following calculation scheme have been used:

Raw materials = (production required)x(difference in moisture content between raw materials and finished product) x 0.95 (efficiency factor during operation).

Raw materials utilized per product unity (ton)

PWF1:	Rice	725	kg
	Skimmed Milk powder	200	kg
	Sugar	150	kg
	Vitamins	0.42	kg
	Iron	0.09	kg
	Calcium	4	kg
PWF2:	Rice	264	kg
	Maize	528	kg
	Soy	332	kg
	Oi	150	kg
	Sugar	100	kg
	Vitamins	0.42	kg
	Iron	0.09	kg
	Calcium	4	kg

HPSC:	Maize	420	kg
	Wheat	320	kg
	Rice	180	kg
	Cocoa	30	kg
	Sugar	80	kg
	Salt	20	kg
	Vitamins	0.42	kg
	Iron	0.09	kg
	Calcium	4	kg

MSC:

Rice	610	kg
Soy	320	kg
Sugar	80	kg
Malt	20	kg
Salt	20	kg
Vitamins	0.42	kg
Iron	0.09	kg
Calcium	4	kg

The packaging materials needed for both types of products are similar: polypropilene bags introduced in printed carton boxes.
The quantity of packaging material needed for one ton of product are approx:

polypropilene film	kg.40
printed carton boxes	N. 3400
corrugated carton boxes	N. 140

VI.7 Maintenance and repair facilities

The requirements for this aspect of the project has been based on considerations of the existing plant operations at GMC.

Running the equipment at full capacity (3 shifts) the plant will need at least four skilled technicians to cover all mechanical maintenance requirements.

The number of 4 technicians as above indicated has been calculated to cover also rest periods, holidays, sickness and weekends.

The skills needed in addition to mechanical maintenance will be instrument, control and electric cover.

All technicians will require their own personal tool kit and some shared tools.

In the workshop at least the following should be installed:

- Centre lathe
- Turret milling machine
- Bench/pedestal drill
- off hand pedestal
- pipe threading machine
- workbenches
- welding equipment.

Note: on considerations of the existing activities at GMC, all the above mentioned tools and instruments are already available at site.

VI.8 Ancillary equipment

For the proper execution of the factory operations it will require the following equipment:

- n.3 manual fork lifts (pallet
- n.1 automatic elevator trolley
- n.1 vacuum cleaner
- n.1 water jet cleaner
- n.1 die washer
- set of metal shelves for pallets

VI.9 Auxiliary plants

For the proper running of the production plant, it will require the following plants:

- n.1 industrial water refrigeration group
- n.1 hot air exhaustion system
- n.1 air compression group
- set of materials for electric, hydraulic, and pneumatic connections among the machines composing the production line.

Technical requirements and specifications are detailed in the attached list of equipment.

VI.10 Plant layout

Being GMC a milling company, the supply and handling of raw materials to the production plant has not been considered as a major issue for this study. Therefore, the raw materials storage room has been given a reduced space, compared to standard layout requirements.

However, the policy adopted for the elaboration of the layout is the generally accepted one of straight line processing, inevitably compromised at some points but adhered to as much as possible.
This concept simply involves bringing all the raw materials in at one end of the plant and taking all the product out at the other end.
The major compromise in this instance is the final mixing stage in the production of PWF, which requires a separate room, on account of hygienic procedures and sanitation.
Other layout concepts are, of course, possible but the one suggested here is believed to give the tidiest arrangement and to be the most flexible in consideration of the two different types of products to be manufactured and in case of future additions or extensions of the plant object of this study.
The general arrangement of the factory is shown in the diagrams.
The factory is already existing and is part of GMC operation area.

Note: the description of the characteristics of process building, administration offices and other departments is being detailed according to the specifications of the already existing structures at GMC site (i.e. workshop and spare parts stores, canteen, and other buildings).
On the basis of the information and data received, no external works are required.

VI.11 Considerations on the building characteristics

We have taken into consideration a raw materials hangling system where it is foreseen the raw materials manual feeding of flours by a feeding cell.

The following must be provided for:

- raw material storage room
- finished product storage room
- additional ingredients room
- hygienic and sanitary personnel services
- general services structures (offices, workshop, etc.)

The production areas will have to adapt the following safety systems:

- insulated premises with restricted admittance (only for production personnel) and previous passage in the dressing-rooms equipped with wash-basins, showers and personal cleaning systems.
- All rooms must be conditioned
- Personnel passing from the dressing to the production room, will have to go through a decantation zone. If this is not possible, it must be foreseen a double automatic closing door system.
- The joining angle between the wall and the floor will have to be rounded. Furthermore the floor must be even as much as possible without cracks where dust or dirt could deposit.
- The walls will have to be painted with washable and anti-mould paintings.

- All external openings will be closed with meshes in order to avoid mouses, birds, insects, etc., entering.

Other recommendations for the quality and hygienic product as follows:

a)Areas.

Areas in proximity of the food factory must not present situations that can in anyway cause products contamination, in particular:

1)Mis-put tools, wastes, garbage, discored materials, offshoot or uncultivated grass, nearby the buildings and structure; the above mentioned can become attraction element, reproduction site and refuge for rodents, insects and other parassites.

2)Roads, squares and parking lots too dusty which can be a contamination source in the areas where food products are exposed

3)Areas with inadequate drain; all this can contribute to the food items contamination by infiltration or dirt, besides to being constituting the ideal site for insects and mycrorganisms reproduction.

b) Plant, design and building

Premises and structures must be designed and built in order to simplify maintenance and sanitary operations. Plants must:

1) have enough space for the collocation and utilization of the equipment and materials required by sanitary operations. Floors, walls and ceilings must be easy to clean, they must be kept clean and in good maintanance conditions. Pipings and tubes must not be suspended over the production areas to avoid that drops or condense might contaminate the food products, raw materials or those surfaces in contact with the product.

Passages and spaces among the equipment, or between equipment and walls, must not be obstructed but have sufficient space so that the personnel can perform its task without contaminating products or surfaces with their clothings or by direct contact.

2) Foresee a distinct separation or adequate collocation of those operations which can cause food products contamination by mycrorganisms, chemical substances, or other external and undesirable materials.

3) Dispose of an adequate lightening on wash-basins, dressing-rooms, toilets, where products or food ingredients are analysed, worked or stored, where cleaning of tools and various devices is made.

As for lamps, electric systems, skylights or other glass objects is concerned, suspended over the food products exposed in any working phase, it must be used safety models or foresee an adequate protection in order tc prevent product contamination in case of breakings.

4) Dispose of an adequate ventilation with shrewdness in order to reduce odours, fumes and vapors (included water vapor) in the areas where the product can be contamined.
Ventilation must not contribute to the product contamination by contaminant agents transported by air

5) Where necessary, to have efficient protections against animals, in particular birds, rodents and insects.

VI.12 Chemical-technological laboratory

The chemical-technological laboratory is of the utmost importance for a company whose objectives are production quality and improvements of the technogical-scientific knowledge.
This laboratory will have the following functions:

- raw materials quality control
- process control
- finished product quality control
- process optimization
- new processes/products development
- base research, with particular attention to the nutritional aspects.

The functions of the laboratory as above listed will contribut to the products development and identification in order to meet the target market requirements and to establish a technological know how and scientific knowledge, which are important for the company's development and growth.

VI.12.1 Raw materials quality control

From this operation depends the standard quality of the finished product, and this is the reason why this activity is considered the basic one for the production activity.
Apart from the specific analysis described here below, the raw materials system gives the specifications of all the raw materials that must be met with by the various suppliers.

The following and specific instruments are generally recommended for this type of quality control:

Type of analysis	Equipment/instruments
- moisture	moisture scale
- granularity	vibrating sifter
- structure and impurities	mycroscope(with polarized light)
- protein	KJELDHAL
- fats	SOXHLET
- ashes	muffle
- mycrobiological purity	laminar flow, hood stomacher,autoclave, plates and cultivation soils
- rheology	Brabender viscoamilograph
- viscosity	viscosimetre

The equipment will be completed with a thermostatic bath, a technical and an analytic scale, a centrifuge and a stove.

VI.12.2 Process control

It is recommended to control all the parameters with hourly frequency.
Generally, the indicators located on the various machines are sufficient to give a general situation, but it would be better also to have available:

- mercury and electronic thermometres for specific controls
- portable anemometer for air speed
- hygrothermograph and ambiental conditions register
- data processing system (PC)

VI.12.3 Finished product quality control

Beyond the analysis and evaluations as listed at point 1, it is recommended that the same personnel, specifically trained , carries out the organo-leptique evaluations (panel test) and that controls packaging proper realization.

VI.12.4 Process optimization and new process development

For this activity it is essential to have a pilot plant the most similar to the plant used for production.
By means of pilot tests, processing and analysis of intermediate production data, it is possible to improve the current processes and make hypothesis for new ones; the same procedure is followed for new products development.

To implement these activities, the operations described in the following point 5) may come in very useful.

VI.12.5 Basic research

This is not directly related to production but it concerns the philosophy (and feasibility) of the single processes and products.
It is furthermore important for all those innovative projects and therefore for the company's development.
Besides instruments mentioned at point 1), the research activity may require the following instruments in order to carry out the relevant analysis:

colorimeter	colour
meter for H2O activities	H2O activity
INSTRON texturometer	structure and physical properties
UV-VIS spectrophotometer	enzymatic activity, degree of gelatinization
colorimeter	colour
meter for H2O acctivities	H2O activity
INSTRON texturometer	structure and physical properties
UV-VIS spectrophotometer	enzymatic activity degree of gelatinization protein and aminoacidis

HPLC cromatograph — protein and aminoacids

GC — fats, pesticides and microcomponents

VI.12 6 PERSONNEL

The organization and structure of such a chemical-technological laboratory can be orientatively the following:

1 chief laboratory graduated in Chemistry or Chemical engineering

1 person in charge of mycrobiological controls, graduated in Biology or Food Technology

2 senior analysts, graduated in Chemistry, Pharmacy, Food Technologies or Biology

2 junior analysts with high school technical or scientific certificate

3 technologists, with high school technical or scientific certificate

3 operators with secondary school certificate.

VI. 3 Factory layout

The general arrangement of the factory is shown in the diagrams.
The factory is already existing and is part of GMC operation area.

VI. 13. 1 Process buiding

Note: the description of the characteristics of process building, administration offices and other departments is being detailed according to the specifications of the already existing structures at GMC site (i.e. workshop and spare parts stores, canteen, and other buildings).
On the basis of the information and data received, no external works are required.

VI. 14 Costing Information

A) Local construction work

The cost related to the small modification and adjustment of the process building (i.e. floor materials,inside masonry, etc.) has been estimated according to Pavan Mapimpianti specifications.

B) Equipment and plant

Pavan Mapimpianti shall supply all the required machinery and equipment, starting from the raw materials handling section down to the packaging equipment of the final products: the supply includes all the necessary equipment and instrument for the analysis and quality control laboratory.
For the scope of supply and list of machinery and equipment, as in the attached list GMC shall be in charge of all the ancillary and auxiliary plants and equipment according to Pavan Mapimpianti specifications.
The cost relevant to the supply of production plant and laboratory equipmant is indicated as a budjet price, not withstanding the fact that the plant design and layout have been considered in detail.
At a feasibility stage, and for long term overseas projects, it is unsual, as a matter of fact, to provide breakdown prices and detailed quotations.

Being the project based on a joint technical cooperation, the overall value of buildings, auxilliary and ancilliary equipment and plants has been estimated by both parties, i.e. GMC and Pavan Mapimpianti management.

VI. 15 Transfer of know-how

This paragraph covers the content of services provided by Pavan Mapimpianti such as:

- training of Philippino technicians
- technological assistance
- implementation of a Research and Quality Control Laboratory.

VI. 15. 1 Training, Sart-up, Technical Assistamce

Pavan Mapimpianti offers the necessary services in order to guarantee the correct transfer of technology.
Therefore, it will be organized in Pavan Mapimpianti's Research Centre, the training of quality control analysts, food technologists and mechanical engineers before the installation of the palnt. During this period it will be set a first programm of product research and development, utilizing pilot plants.
Once the plant has been shipped, Pavan Mapimpianti will send their specialized engineers and technologists to supervise the erection, the start-up and to transfer the relevant know-how.
Furthermore, Pavan Mapimpianti shall give technical and technological assistance to the customer for supervision during the first period of the plant running.

VI. 15. 3 Implementation of a Research and Quality Control Laboratory

The project includes a specialized quality control laboratory equipped with the basic instrumenta needed for the inspection and control of raw materials and finished products and all necessary equipment for the analysis of protein and fat content, microbiological analysis, general purpose analysis.

LIST OF EQUIPMENTS

A) Line for Precooked flours, cap. 350 kg/h

1A Horizontal flour mixer FM700, complete with control panel
2A Vertical feeding screw Fs500/V
3A Horizontal feeding screw FS500/0
4A Gelatinizer G502
5A Screw extractor SE/G/502
6A cutting system SCP500
7A Pneumatic conveyor Pc500/SCP-BTO
8A Control panel 4A-7A
9A Belt toasting oven BTO 500 (heat exchanger)
10A Cooling belt CC70/5000
11A Vibre screen VS120
12A Feeding scr w with hopper FSH500
13A Feeding screw FS500/V
14A Control panel 9A-13A
15A Grinding system (complete with control panel)

B) Additional machinery to section A) for the production of baby food, cap. 550 kg/hr

1B Bag emptying hopper
2B Pneumatic conveyor
3B Precooked flours storage bins (complete with extraction screws)
4 Bilk storage bins (complete with extraction screws)
5B Sugar storage bins (complete with extraction screws)
6B Powder filter
7B Sugar grinding system
8B Horizontal mixer FM50

9B Feeding screw FS100/V
10B Automatic scale
11B Pneumatic conveyor
12B Control panel 1B-11B
13B Storage bin
14B Horizontal mixer FM700
15B Centrifuge sieve
16B Feeding screw FS700/V
17B Feeding screw FS700/O
18B Control panel 13B-17B
19B Vertical packaging machine (complete with control panel)
20B Automatic cartoning machine (complete with control panel)

C) Additional machinery to section A) for the production of toasted pellets (savoured), cap. 500 kg/hr

1C Pneumatic conveyor PC500/G-F
2C Former F500
3C Pneumatic conveyor PC500/F-TM
4C Screw extractor SE/F/500
5C Control panel 1C-4C
6C Shaker pre-dryer TM500
7C Pneumatic conveyor PC500/TM-CD
8C Vertical spreader SP120
9C Continuous dryer CD120/500/5/18
10C Vibre screen VS120
11C Control panel 6C-10C
12C Die washing machine LT500
13C Elevator belt EB350/6000
14C Storage bins
15C Vibre screen VS120
16C Belt conveyor BC350/6000
17C Control panel 13C-16C
18C ponderal doser PD500 /complete with control panel)
19C Elevator belt Eb350/3000
20C Flavouring tumbler FT500

21C Flavours mixer MT300/2
22C Elevator belt EB350/5000
23C Control panel 19C-22C
24C Vertical packaging machine (complete with control panel)
25C Automatic cartoning machine (complete with control panel)

TECHNICAL DATA

INSTALLED POWER:

1A	FM700	9KW
8A	CP/4A-7A	128KW
14A	CP/9A-13A	24KW
12B	CP/1B-11B	53KW
18B	CP/13B-17B	13KW
19B	PACKAGING MACHINE	8KW
20B	CARTONING MACHINE	5KW
4C	CP/1C-4C	77KW
11C	CP/6C-10C	56KW
12C	DIE WASHING MACHINE	12KW
17C	CP /13C-16C	3KW
18C	PONDERAL DOSER	0,5KW
23C	CP/19C-22C	11KW
24C	CP/19C-22C	8KW
25C	CARTONING MACHINE	5KW

POTABLE WATER CONSUMPTION:

4A G502 250l/h, temperature at 25-70-C
2C F500 500l/h, temperature at 70-C for head heating for 15'-20'min.

INDUSTRIAL WATER CONSUMPTION FOR COOLING: Pression 1,5 bar +/-0,5 bar

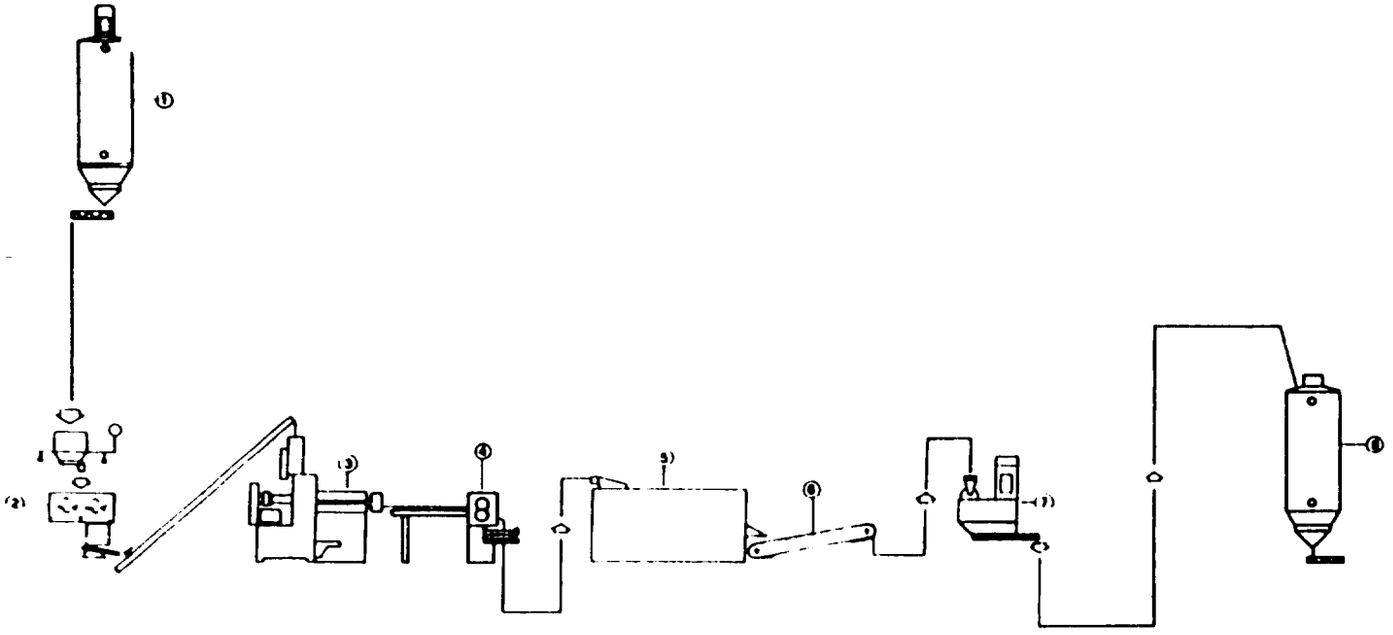
4A	G502	1000-1300 l/h
2C	F500	1200-1500 l/h, temperature at 15-

THERMIC INSTALLED POWER:

9A	BTO 500	350.000 Kcal/h gasoline heating
6C	TM 500	35.000 Kcal/h H_2O at 95-C, t=3-C, pressure 1,5 bar +/-0,5 bar
9C	CD120/500/5/18	140.000 Kcal

AIR COMPRESSED CONSUMPTION: 800Nlt/h for the whole plant

CHAPTER VI
TABLES



1. RAW MATERIAL STORAGE BIN
2. RAW MATERIAL WEIGHING AND MIXING
3. COOKING GROUP
4. CUTTING GROUP
5. DRYING GROUP
6. COOLING BELT
7. MICRO MILLING
8. FINISHED PRODUCT STORAGE

Fig.1

NOTE: PLANT SUITABLE FOR CONTINUOUS PRODUCTION AND PACKAGING

PLANT FOR THE PRODUCTION OF PRE COOKED FLOURS AND/OR PREGELATINIZED STARCHES

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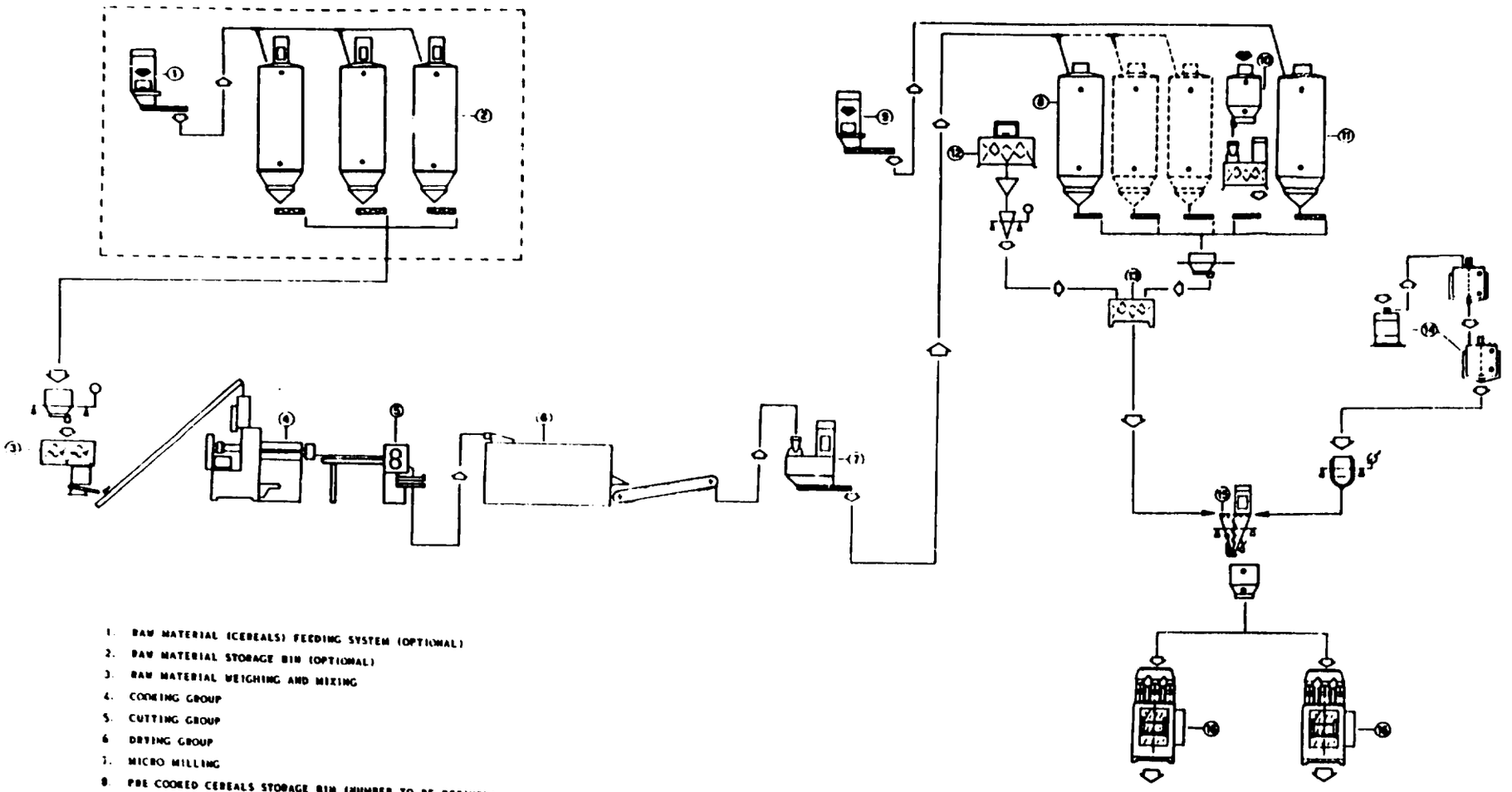

1. RAW MATERIAL (CEREALS) FEEDING SYSTEM (OPTIONAL)
2. RAW MATERIAL STORAGE BIN (OPTIONAL)
3. RAW MATERIAL WEIGHING AND MIXING
4. COOKING GROUP
5. CUTTING GROUP
6. DRYING GROUP
7. MICRO MILLING
8. PRE COOKED CEREALS STORAGE BIN (NUMBER TO BE DEFINED)
9. POWDERED MILK FEEDING SYSTEM
10. MICROMETRIC SUGAR POWDERING AND STORAGE
11. POWDERED MILK STORAGE BIN
12. ADDITIVES (FRUIT POWDER - FLAVOURS - ETC.) MIXING AND WEIGHING
13. PRE COOKED FLOUR WEIGHING AND MIXING
14. OILY ADDITIVE PREPARATION AND WEIGHING
15. OIL/FLOUR MIXING
16. PACKAGING

Fig.2

NOTE PLANT SUITABLE FOR CONTINUOUS PRODUCTION AND PACKAGING

TYPE AND NUMBER OF MACHINES TO BE DEFINED ACCORDING TO PRODUCT AND PACKAGE SIZE

PLANT FOR THE PRODUCTION OF BABY FOOD CEREAL BASED

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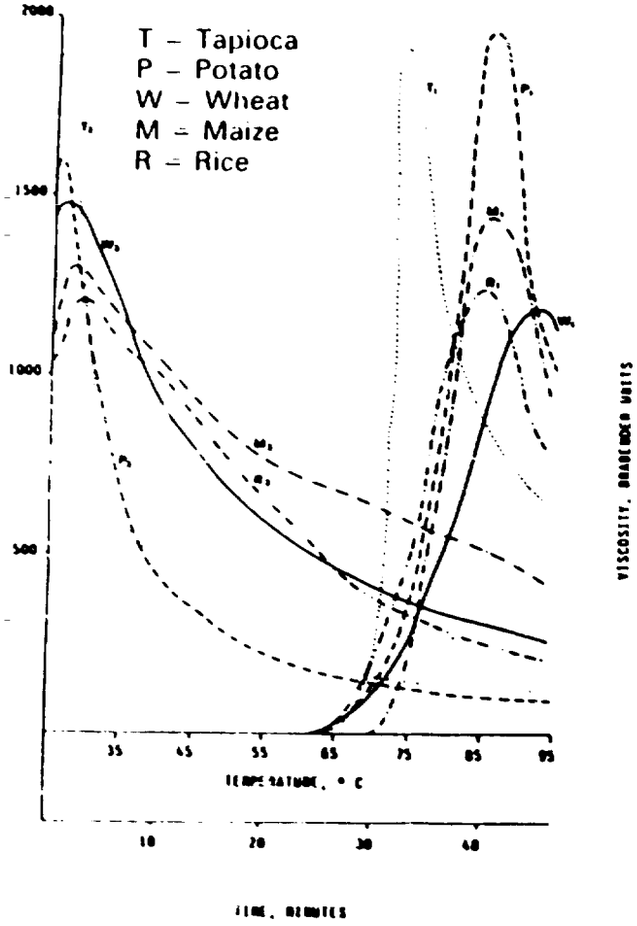


Fig 3: Viscosity behaviour of pregelatinised starches (2) by extrusion-cooking and their corresponding crude starches (1).

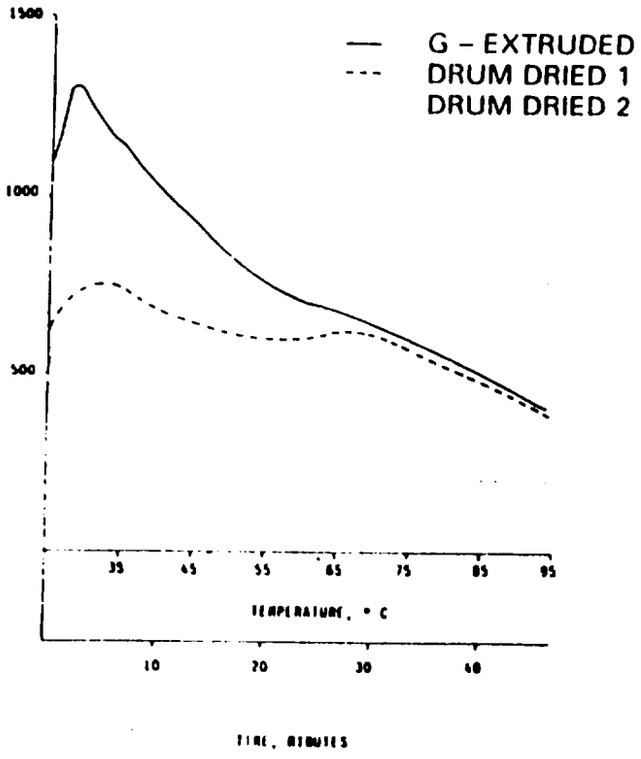


Fig 4: Viscosity behaviour of Mapimpianti extruded pregelatinised corn starch and commercially available Drum- Dried corn starch.

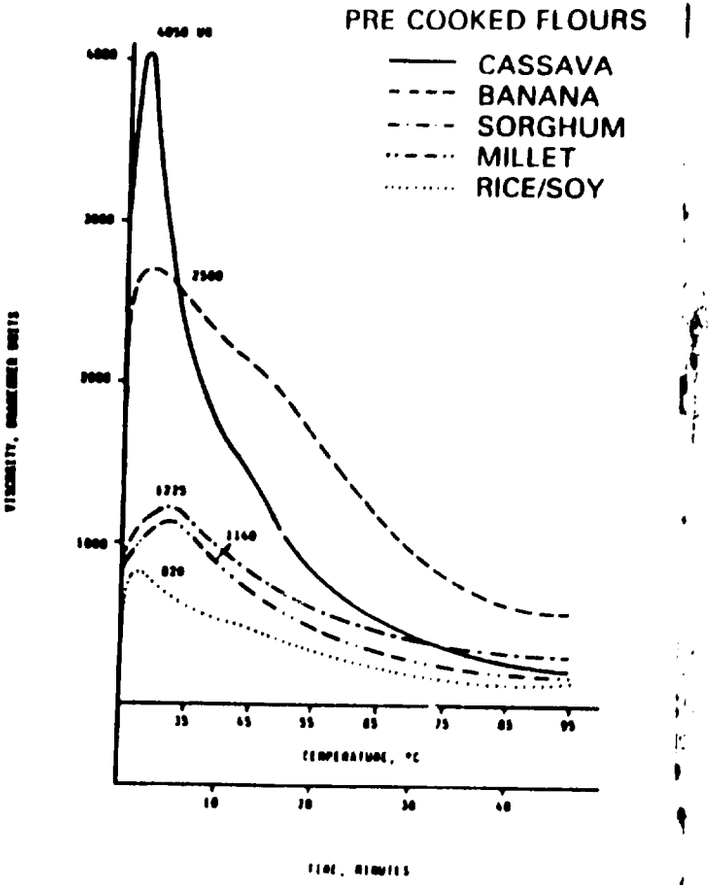


Fig 5: Viscographs of pre-cooked flours at 10% conc. and 350 cm-g cart.

TABLE 1: MICROBIAL ANALYSIS OF UNCOOKED AND COOKED FLOUR BY EXTRUSION COOKING

Uncooked flour:	
1. Aerobic plate count	1.45×10^4
2. Coliforms	1.5×10^3
3. Mold Yeast	absent
Cooked flour:	
1. Aerobic plate count	10
2. Coliforms	absent
3. Molds.Yeast	absent

All values are reported as col/g.

TABLE 2: ANTI NUTRITIONAL ENZYME DEACTIVATION BEFORE AND AFTER EXTRUSION COOKING OF RICE SOY FLOUR

Sample	Final extrusion temperature	Urease activity (a) (Δ pH units)	Trypsin inhibitor (b) (TIU/mg)
Non-processed admixture		1.95	15.0
Admixture processed in the extruder	150 – 160 C	0.13	1.5

a) AACC method 22-90
b) AACC method 71-10

TABLE 3: AMINO ACID PROFILE OF RICE-SOY FLOUR BEFORE AND AFTER EXTRUSION

AMINO ACID	RAW	EXTRUDED
Aspartic Acid	12.79	10.34
Threonine	3.96	3.48
Serine	4.86	4.03
Glutamic Acid	15.20	12.00
Proline	7.50	6.00
Glycine	4.50	4.29
Alanine	5.06	4.44
Valine	7.00	5.87
Methionine	2.10	1.64 ([21])
Isoleucine	4.33	4.00 ([8])
Leucine	7.50	7.50
Tyrosine	3.97	3.01
Phenylalanine	5.88	5.33
Lysine	5.64	5.26 ([7])
Histidine	3.28	3.18
Arginine	5.37	5.07 ([6])

( ) Percentage of Amino Acid Loss.

Total Lysine (acid hydrolysis) (g/16 g N)	5.26
Available Lysine FDNB – reactive (g/16 g N)	4.64
% losses	11.80

TABLE 4. REHABILITATIVE POTENTIAL OF EXTRUDED INFANT FOOD

Sample	Initial Wt. (g)	Dep. Wt. (g)	Rehabilitation WT	ADG	ADF	FCE	PER
SRF (15% CP)*	54.75	38.77	83.10	3.17	7.19	2.27	2.94
Extruded 1	54.53	38.39	74.71	2.64	6.46	2.45	2.64
Extruded 2	53.05	37.44	82.33	3.19	7.24	2.27	2.93

*SRF = Standard reference formula (fortified with synthetic amino acids)
ADG = Average daily grain ADF = Average daily feed.
FCE = Feed conversion effeciency. PER = Protein efficiency ratio

TABLE 5: GROWTH PERFORMANCE OF RATS AFTER 42 DAYS FEEDING USING DIFFERENT CEREAL BABY FOOD

Infant Food Sample	Dietary Crude Protein (%)	Daily Body Weight Gain Week 1 – 6 (g)	Daily Feed Intake Week 1 – 6 (g)	FCE* Week 1 – 6
Commercial 1	20.10	2.31	7.55	3.27
Commercial 2	17.20	2.16	7.28	3.37
Commercial 3	15.40	1.91	6.58	3.45
Extruded 1	15.50	1.73	7.21	4.17
Extruded 2	15.00	2.27	9.10	4.00
		0.17**	0.34**	0.50**

*FCE = Feed conversion effeciency.
**SEM = Standard error of means, P 0.01.

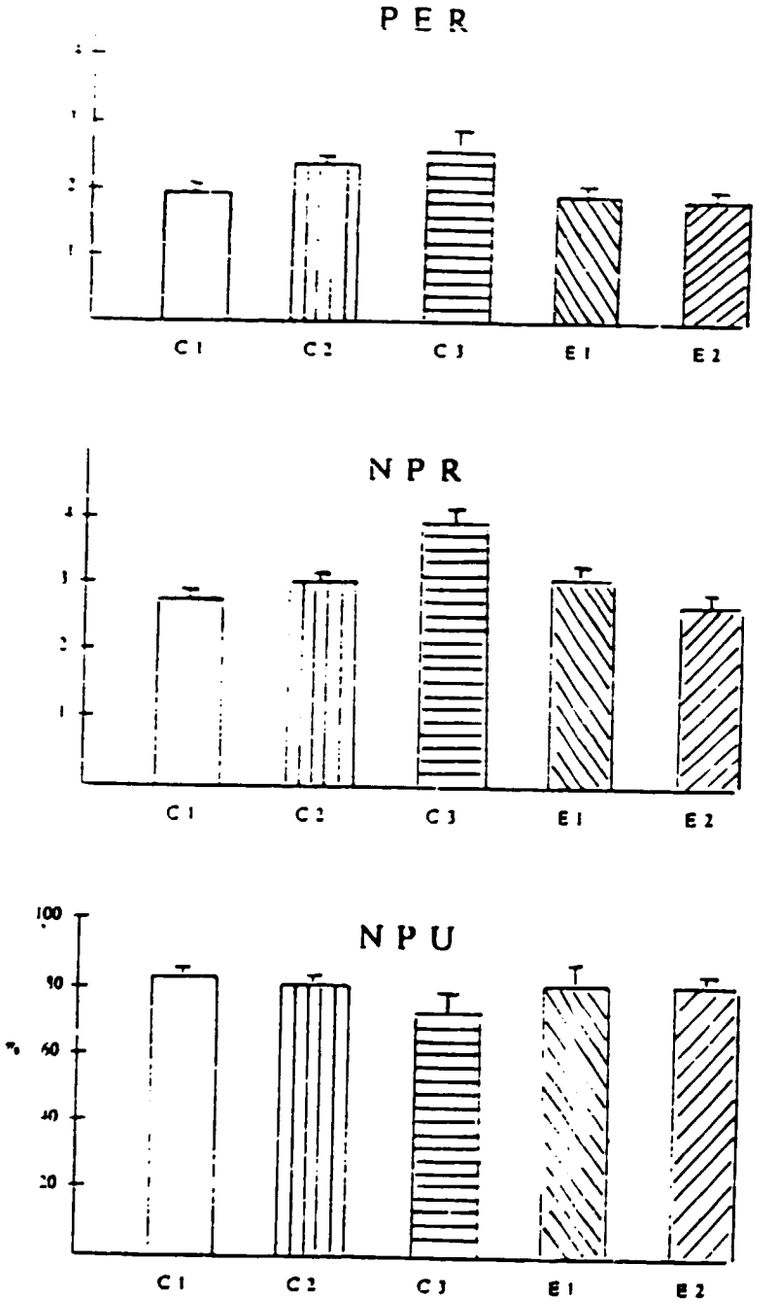


TABLE 6: Nutritional indices of extruded baby food formulae compared with commercial baby food in the market.

Tab.7

PRODUCTION PLANT

MAIN EQUIPMENT NEEDED FOR OPERATIONS	BABY FOODS	SHAPED CEREALS
FLOUR MIXER	RAW MAT. MIXING	RAW MAT. MIXING
COOKER EXTRUDER	EXTRUSION COOKING	EXTRUSION COOKING
FORMER EXTRUDER		EXTRUSION FORMING
CUTTER	CUTTING	
SHAKER PREDRYER + CONTINUOUS DRYER		DRYING
HIGH TEMP. OVEN	DRYING AT HIGH TEMP.	EXPANSION-TOASTING
COOLING BELT	COOLING	COOLING
DISK MILLING SYSTEM	MILLING	
SILOS	INTERMEDIATE STORAGE	
WEIGHER + MIXER	FINAL BLENDING	
VOLUMETRIC DOSER + VERTICAL PACKAGING MACHINE	PACKAGING	
GRAVIMETRIC DOSER + VERTICAL PACKAGING MACHINE		PACKAGING

CHAPTER VII

Plant Organization and Overhead Costs

CHAP. VII PLANT ORGANIZATION AND OVERHEAD COSTS

VII.1 Plant organization

The plant organization for the Infant foods factory is shown in drawing no. 1 and is based on a combined assesment of the project engineering for an output of 3000 tpa and current Philippines factory operational approach. The proposed factory, run under the General manager, will be organized into four different cost centres each with their own Heads of Department. These centres are:

1)Marketing and Sales
2)Operations
3)Finance
4)Administration

This new factory has been considered as a division of GMC, inside the existing structure and not as a new company. Therefore many costs (mainly fixed) will be computed as a percentage of the overall structure costs.
The two major cost items that are costed as factory building overheads for the infant foods plant are:

A)Insurances

Insurance costs for equipment, goods and vehicles used in the baby foods plant are estimated as follows:

Machinery/Equipment	- 0.35% of acquisition cost
Building	- 0.35% of acquisition cost

Finished Goods/raw Mat'ls Inventories	- 0.35% of ending inventory value
Vehicles	-0,80% of acqiusition cost

b) Manpower for warehouse and laboratory

Under this voice will be included the labour cost of those employees working in the warehouse and in the laboratory.

VII.3 Administrative overheads

The cost of administrative expenses has been calculated as 0.8% of the sales.
This figure includes costs of audit fees, telecommunications, legal fees, office maintenance, consumables and other administrative expenses .

VII. 4 Other costs

a) Promotion/Advertising

Usually the cost of Advertising and Promotion in the Philippines for major marketing support is estimated to be 5.0 to 15.0% of net sales.A strong marketing compaign has been recommended:

b) Corporate income taxes

A value of 35% of taxable income has to be calculated:

c) Depreciation charges

The values are calculated as follows:

	Depreciation period (years)	Scrap value
Building	20	0
Machinery/Equip. Major	10	0
Machinery/Equip. Minor	5	0
Vehicles	3	0
Pre-operating expenses	5	0

CHAPTER VIII

Manpower

CHAP. VIII MANPOWER

The staff required for the running of the factory has been estimated to 68 units.

Table 8.1 which follows shows how the staffing estimate for operation on production lines. The vast majority of people would only work during the daytime or its equivalent shift. Fewer people are normally required for subsequent shift operations, relying on the day time workers for a lot of preparation for which they would have time. Table 8.2 gives an overall view of the factory organ.sation and staffing.

VIII.2 Labour requirements and costing

The manpower requirements listed in the table are for both labour directly involved in the processing of the baby foods (direct labour) and other indirect labour necessary for the running of the factory and its business. The split is 34 processing workers (direct labour) and 34 administrative and other staff (indirect labour).
The cost of labour includes 13rd month pay, benefits and social costs which are calculated on the basis of 20% of the annual rate.

One of the basic considerations for the success of the project is the introduction of this production line into an existing production organization.
Within this frame GMC can provide trained management and there will be no need for basic food industry operation training for the personnel.

Anyway as this particular type of production is not yet introduced in the area, a specialized training has been foreseen for the most important roles of the plant operation: the chief of the production line and the responsible of products; i.e. 2 persons for one month period.

The training period will be executed partly at plant supplier premises for general mechanical and technological training, and on site for practice training.

CHAPTER VIII

TABLES

CHAP. VIII

TAB. 8.1 DIRECT MANPOWER REQUESTED FOR OPERATION ON PRODUCT LINES

Raw material handling	No.	No. of shifts	Total
Skilled	1	3	3
Unskilled	2	3	6
Processing			
Skilled	1	3	3
Unskilled	2	3	6
Chief of shift	1	3	3
Final mixing and pack for PUF			
Skilled	1	1	1
Unskilled	2	1	2
Chief of shift	1	1	1
Packaging for ISC			
Skilled	1	3	3
Unskilled	2	3	6

CHAP. VIII

TAB. 8.2 FACTORY MANPOWER

ADMINISTRATION	NO.
Factory Manager	1
Administrative Assist.	2
Secretary	1
Messenger	1
Driver/Utility	1
FINANCE	
Chief Accounting	1
Accounting Supervisor	1
Accounting Clerks	3
MARKETING	
Marketing Manager	1
Assist. Brand Manager	1
Secretary	1
PRODUCTION	
Production Head	1
Production Supervisor	4
Skilled Workers	10
Unskilled Workers	20
WAREHOUSE	
Supervisor	1
Skilled Workers	1
Unskilled Workers	1
LABORATORY	
Supervisor	1
Analyst	2
Semi-Skilled Workers	2
MAINTENANCE/UTILITIES	
Supervisor	2
Skilled Workers	5
Semi-Skilled Workers	2
Unskilled Workers	2
GRAND TOTAL	68

CHAPTER IX

Implementation Schedule

CHAP. IX IMPLEMENTATION SCHEDULE

The following diagram shows the proposed time schedule of events for the complete project implementation leading from the availability of finance (and hence the decision to proceed) to project completion and start-up. It is anticipated that it will require 12 months to get from the instruction to proceed to start-up.

The schedule has been divided into four main description headings namely:

1. Design, tender and realization of civil works;
2. equipment procurement/supply;
3. installation and final commissioning;
4. training and technological assistance

and these can be commented on in that sequence.

IX.1 Design, tender and realization of civil works

These activities will take 5 months to complete and will include the preparation of all civil/structural design for the necessary building modifications, specification and documentation necessary for the execution of the civil works. After the documentation has been prepared by the end of month 2, one month will be allowed for analysis and adjudication.

At the end of month 3 appointments will have been made and the contractor will be ready to mobilize in month 4.

Estimated required time to carry out the necessary civil works is 2 months approx.

IX.2 Equipment procurement and supply

Documentation for the supply of plant and equipment will be prepared during months 2 and 3, because some general work on redefining flow diagrams and plant layouts will be needed in month 1 to coincide with the preparation of the building works documents. Evaluation will be in months 4 and one month has been allowed for a final decision.
Design and manufacture of the plant and equipment will be from month 6 to 8 inclusive, and transportation and delivery to site will be during months 9 and 10.

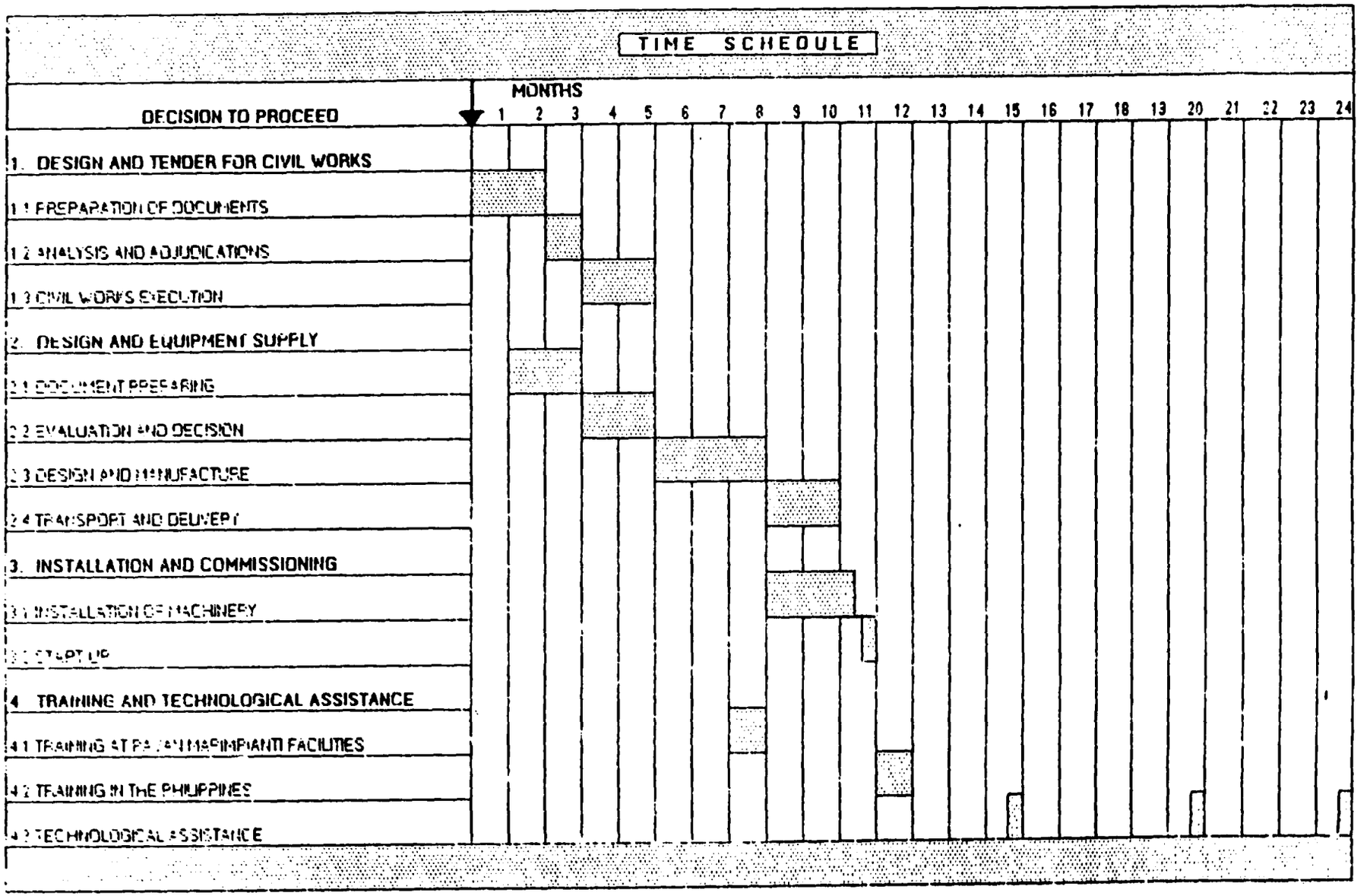
IX.3 Installation and final commissioning

Installation of machinery and equipment will start by month 9 for 2,5 months and be completed by half of month 12.
Testing and commissioning of plant and equipment will be made in 15 days during month 12.

IX.4 Training and technological assistance

Training of Philipino personnel will be carried out at Pavan Mapimpianti's premises during the design and manufacturing of the plant to be supplied (month 8) for a period of 30 days.

Technological assistance will be provided for a total period of 45 days, to be organized in 15-days sections every 4 months after plant start-up and commissioning.


TIME SCHEDULE
DECISION TO PROCEED
MONTHS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
1. DESIGN AND TENDER FOR CIVIL WORKS
1.1 PREPARATION OF DOCUMENTS
1.2 ANALYSIS AND ADJUDICATIONS
1.3 CIVIL WORKS EXECUTION
2. DESIGN AND EQUIPMENT SUPPLY
2.1 DOCUMENT PREPARING
2.2 EVALUATION AND DECISION
2.3 DESIGN AND MANUFACTURE
2.4 TRANSPORT AND DELIVERY
3. INSTALLATION AND COMMISSIONING
3.1 INSTALLATION OF MACHINERY
3.2 START UP
4 TRAINING AND TECHNOLOGICAL ASSISTANCE
4.1 TRAINING AT PALAZZI MASCHERANTI FACILITIES
4.2 TRAINING IN THE PHILIPPINES
4.3 TECHNOLOGICAL ASSISTANCE

CHAPTER X

Financial and Economic Analysis

CHAP. X Financial and Economic Analysis

X.1 Methodology and assumptions for project evaluation

The financial analysis was carried out over a period of 15 years with the United nations Computer Model for Feasibility Analysis and Reporting (COMFAR).

The following assumptions were made during the elaboration of the financial analysis:

a) The rate of exchange adopted to determine the costs and benefits is:

1 USD = 28 Pesos

Prices and costs are set out in thousands of dollars.

b) The revenues have been calculated according to the following table which illustrates the price structure analysed in the study. As can be seen a 10% of discount has been provided during the first year.

Selling prices of products for the proposed plant

Product/Year	1993	1994	1995/2007
PWF1	2,1	2,3	2,3
PWF2	1,8	2,0	2,0
HPSC	1,9	2,1	2,1
MISC	1,7	1,9	1,9

c) Production capacity has been projected as increasing according to the number of shifts worked, resulting in 33% for the first year (1 shift), 66% for the second year (2 shifts) and full capacity at the third and following years.

Total production, per year and per product are given in the attached Tab.1.

Maximum production capacity is calculated on the basis of three eight-hour shifts for 280 days/year, with a production efficiency of 95%.

We would like to point out that the flexibility of the technological process will make it possible to obtain and optimal product mix with products which are selected rationally and according to the market necessities.

The considered hypothesis represents only one of the several possibilities.

d) In the financial analysis no account was taken of inflation because of its high degree of variability. Due to its effect on the economic indicators it would have modified the long term forecast and therefore the economic validity of the project.

e) A 10% discount rate was assumed for the calculation of the Net Present Value.

X.2 Project Costs and Revenues

The main characteristics of the costs and the revenues are as follows:

X.2.1 Total Initial Investment

The total initial investment is estimated at US$ 6,6 million. The plant is to be constructed in one year.

The investment costs are divided into the following categories:

a) Land	220,000 USD (Local cost)
b) Site development	160,000 USD (Local cost)
c) Building costs	430,000 USD (Local cost)
d) Factory Equipment Costs	4.930,000 USD (Foreign cost)
e) Vehicle Cost	180,000 USD (Local cost)
f) Auxiliary and Service facilities	320,000 USD (Local cost)
g) Pre-production Costs	60,000 USD (Local cost)
h) Inventory	300,000 USD (Local cost)

The value reported for Factory Equipment is divided as follows:

- Basic line (ISC)	2,880,000 USD
- Additional equipment for PWF line	1,580,000 USD
- Auxiliary equipment	105,000 USD
- Laboratory equipment	115,000 USD
Total	4,680,000 USD
- Transfer of technology	250,000 USD
Grand Total	4,930,000 USD

The values of plant, machinery and equipment include the costs of transport (Manila-Cebu), installation, supervision and taxes. The cost of the plants includes spare parts requiments for two years of operations.

Depreciation is calculated assuming a salvage value equivalent to zero.

X.2.2 Production Costs

Total production costs are US$ 1,149,000 for the first year, and US$ 2,180,000 the second year and US$ 3,354,000 for the third and following years.

The main costs are for raw materials (in the table A "Raw material 1"), packaging materials ("other raw materials") and electric power and heat ("energy") which represent 91.5% of the factory costs.

a) Raw materials

The unit costs of raw materials per product and the total cost in the third year of production are summarized as follows:

TABLE A: Costs of Raw Material 1

Product	Unit Cost USD/Ton	Quantity Tons/year	Total Cost USD/year
PWF1	950	520	494,000
PWF2	590	530	312,700
HPSC	750	890	667,500
MISC	460	890	409,400
TOTAL		2,830	1,838,600

In table 2 "Raw Material Quantities" are described the quantities of raw material necessary for the production of each ton of product.

b) Packaging materials

The products would be sold in packages of 300g, bagged in polypropylene in cartons.

The quantities consumed are:

Polypropylene	40 kg/ton of product
Cartons	3400 kg/ton of product
Shipping boxes	140 kg/ton of product

The unit cost of packaging materials is as follows:

Polypropylene	3.2145 USD/KG
Cartons	0.0285 USD/Unit
Shipping boxes	0.4820 USD/Unit

The cost of packaging for one ton of finished product is 293 USD, broken down as follows:

Polypropylene	128.6 USD
Cartons	96.9 USD
Shipping boxes	67.5 USD

The total cost of packaging material is 829,190 USD broken down by product as follows:

PWF1	152.360 USD
PWF2	152.290 USD
HPSC	260.770 USD
MISC	260.770 USD.

c)Utilities and energy

Utility costs include plant water consumption during production cycles. An average consumption of 250 lt/h is estimated at a cost of US$ 4 per m3. The total annual cost is estimated at US$ 6,720.

Energy costs include fuel and electric power for production.

An average consumption of 367 Kwh of electricity is estimated at a cost of US$ 0.1 per Kwh. Heating energy requirements (fuel) are estimated at 75 lt/h at US$ 0.22 per litre.

Total electricity costs are estimated at US$ 246,624 while fuel for production is calculated at US$ 110,880 for a combined total of US$ 357,504 . Table 3 indicates all costs per product.

d)Labour

The attached tab. 4 shows the manpower break down with the related labour costs.

The direct labour force includes workers for the production, maintenance and utilities departments for a total of 46 units costing US$ 114,739. Administration is to be handled by 11 units at a cost of US$ 20,570. Factory overheads include warehouse and laboratory manpower: 8 units at a cost of US$ 22,844.

Distribution and sale of products would be done by the General Milling Corporation (GMC) which is to market the new range of products via its sales network. The personnel requirements for marketing activities have been estimated at 3 units for a total of US$ 20,570.

e)Maintenance/repairs and Spare parts

The maintenance and repair of buildings, auxiliary services and vehicles is estimated at 2% of total costs and comes to US$ 18,600.

Spare parts for the plant and vehicles were estimated at 15% of the cost of plant and machinery (US$ 66,900) and 8% of the cost of vehicles (US$ 14,400) for a total of US$ 99,900.

f)Factory overheads

This cost includes:

- Insurance on machinery/equipment, buildings and inventories. An additional expense equivalent to 10.5% of premiums will be incurred for fire protection/premium tax and stamp duties.
  Total cost is US$ 21,750.

- Labour costs for warehouse and laboratory staff.
  This cost is estimated at US$ 22,844.

Factory Overheads total US$ 44,504.

g)Administrative Overheads

Administrative expenses (postal, telegraph, telephone and others), and audit fees are calculated as 0,8% of sales for a total of US$ 44,155 per year, in full production.

h)Marketing expenses

As in the case of labour, marketing will make use of the existing GMC structures, that is the existing sales network. It has been estimated that the cost would be equivalent to 1% of the sales, for a total cost of US$ 55,000 in full production.

An intensive advertising campaign aimed at introducing the proposed products onto the market has been provided for.

Advertising costs for PWF2 are 20% of sales for the first year, 15% for the second year and 10% for the third year.

For the other products (PWF1, HPSC, MISC) a cost of 10%, 8% and 6% on the sales for the first, second and third year of production respectively has been calculated.

All the direct costs per product have been calculated for the first, the second and the third year of production in table 5A, 5B and 5C.

X.2.3 Sales revenue

The market prices of each item are:

PWF1	2,300 USD/TON
PWF2	2,000 USD/TON
HPSC	2,100 USD/TON
MISC	1,900 USD/TON

(For the first year a supplementary discount of 10%. has been calculated).
The total value of product sales is US$ 5,816,000 at the third year broken down as follows:

PWF1	1,196,000 USD
PWF2	1,060,000 USD
HPSC	1,869,000 USD
MISC	1,691,000 USD

X.2.4 Taxes

- Taxes on sales:
The taxes on sales are included in the prices shown.

- Corporate taxes:
Total taxation is calculated at a flat rate of 35% of taxable income.

X.2.5 Working Capital Requirements

Working capital requirements are indicated in table 4A and 4B of COMFAR.
The working capital necessary for the production of baby food has been estimated at US$ 300,000 on the basis of the following data:

a. Accounts receivable and accounts payable, 30 m.d.c.
b. raw material (flour) 30 m.d.c.
c. raw material (packaging product) 90 m.d.c. (foreign) and 45 m.d.c. local
d. utilities, electric power and heating (fuel and oil) 30 m.d.c.
e. spare parts 90 m.d.c.
f. finished products 15 m.d.c.

X.3 Sales Analysis

The total goods produced will probably be absorbed by the local markets for which reason only the sales on the domestic market were considered. GMC's marketing capacity is such however, that they could in fact branch out and sell their products on foreign markets and create new sales possibilities. Total sales (including taxes) are estimated at US$ 1,734,000 for the first year, US$ 3,836,000 for the second and US$ 5,816,000 for the third and the following years.

The above mentioned data are a conservative sales estimate, which in our opinion, given the dimensions of the local market and the export opportunities which will be opened up by GMC, could be improved upon so as to reach full capacity before the second year of production.

X.4 Summary of Financial Analysis

The results of the financial analysis are set out in the attached COMFAR tables.

Before analyzing them it is necessary to illustrate the financial plans considered.

In the first financial plan (A) we have assumed a foreign line of credit of US$ 4,680,000, this being the cost of imported factory equipment net of the technology transfer envisaged against equity participation by PAVAN MAPIMPIANTI.

The credit is made up as follows:

- Down payment of 15% (equivalent to US$ 700,000).

- Loan of US$ 3,980,000 (the remainig 85%), at 10% interest repayable over 8 years, with a two year grace period, in half year installments in arrears.

The interest rate shown is an average based upon present economic and financial conditions.

Equity amounting to US$ 2,620,000 is apportioned as follows:

- GMC = 2,370,000 USD of which:
  - 1,670,000 USD covers all local investment costs, pre-production costs and initial working capital requirements and
  - 700,000 USD covers the downpayment on the credit line.

- PAVAN MAPIMPIANTI = 250,000 USD which corresponds to the technology transfer that will be implemented via a programme of training and technical support.

Under the second financing plan (B) we have assumed a grant of US$ 1,580,000, to be put up by a public development agency.

Thereunder, the credit arrangements would be as follows:

- Down payment of 15% amounting to US$ 465,000 to be covered with equity
- Loan of US$ 2,635,000 at the same conditions as plan A.

As a result, equity would amount to US$ 2,385,000 broken down as follows:

- GMC = 2,135,000 USD
- PAVAN MAPIMPIANTI = 250,000 USD

a)Profitability indicators.

Net profit is already positive in the second year of activity, amounting to US$ 127,000. All profitability and economic indicators start to show positive values as of the second year, as summarized in the following table:

	1994	2003
Gross profit/Total sales, %	5.1	32.6
Net profit/Total sales, %	3.3	21.2
Net profit/Equity (ROE) %	4.8	47.1
Return on Investment, (ROI)%	7.3	17.4

The aggregate cash flow becomes positive in the sixth year of production and reaches US$ 12,588,000 at the fifteenth year (see table 8.1A and 8.2A).

b)Net present value and IRR

The value of the net present value and of the internal rate of return are given in table 7A.
The net present value of US$ 2,915,000 has been calculated using a discount rate of 10%.

Under such conditions the internal rate of return on total investment is 16.11%.
Table 10A shows the results of the sensitivity analysis summarized below.
The fluctuation in sales, prices and operating costs are illustrated for specific values.

	Sales	Operating cost	Initial Investment
% change	- 20	+ 20	+ 20
new IRR %	- 4.47	5.51	12.93
% change	- 10	+ 10	+ 10
new IRR %	7.68	11.22	14.42
% change	+ 10	- 10	- 10
new IRR %	23.07	20.49	18.08
% change	+ 20	- 20	- 20
new IRR %	29.24	24.53	20.41

From the variations in IRR and fluctuations in the prices one can appreciate the importance of an appropriate marketing strategy, also in view of the fact that the cost structure shows little dependance upon fixed costs.

Financial plan (B), which calls for a grant for the purchase of part of the plant, grows out of the considerations already stated in the executive summary.

This plan assumes a grant component equivalent to the investment necessary to fit out the basic line with all the specific equipment needed to produce PWF. This plan is far more interesting from the financial point of view as the reduction in financing requirements (34% roughly) enhance the project's financial attractiveness.

Under these conditions, a greater availability of financial resources thanks to lower interest payments, would allow a number of degrees of freedom in defining the selling price, in order to achieve an optimal marketing strategy and improve the economic parameters.

In figures, the COMFAR Analysis gives the results shown in the attached table.

The net profit reaches US$ 211.000 in the second year (against US$ 127.000 under plan A).

The cash balance becomes positive earlier, i.e in the second year, to the tune of US$ 229.000 as against a deficit of US$ 78,000 under plan A.

As far as profit and economic indicators are concerned, these are summarized as follows:

	1994	2003
Gross profit/total sales, %	8.4	32.6
Net profit/total sales, %	5.5	21.2
ROE (Net profit/Equity),%	8.8	51.7
Return on Investment (ROI),%	6.7	17.4

The value of the Net Present Value discounted, once again at 10%, is equal to US$ 2,806,000, with an IRR on total investment of 15.86%.
Moreover we can see an increase of:
IRR E1 (20.19% vs 17.37% of sol.A)
IRR E2 (26.19% vs 19.49% of sol.A).

X.5 The Project's contribution to the country's economic development

To evaluate the real contribution of the project to the economy of the Philippines, it would have been necessary to carry out an economic analysis which would have provided more detailed figures.

Given the restricted size of the proposed project we thought it useless to carry out a detailed cost-benefit analysis, which would have provided only marginally meaningful figures.

In fact the project will not affect the Philippine Economy significatly, but, nevertheless, it will have considerable impact on the food industry.

The benefits, therefore, will be represented mainly by social improvements in the living standards, food habits, and in the nutritional composition of children's diets.

This contribution to social welfare is, without any doubt, one of the major components of economic growth.
Anyway we can also point out some facts which make self-evident the importance of the project for the Philippine economy.

Foreign Exchange Impact

The production of the factory has been intended mainly to replace present imports; this would benefit the economy by reducing the outflow of foreign currency.
The import substitution effect is only partially offset by the need of importing some minor ingredients of the product.
Moreover, GMC's capability to expand considerable quantities of product can further enhance the Foreign Exchange balance.

Employment

Employment would not only be generated in the factory itself, but also in the food industry or in other related sectors such as packaging, transport and retail distribution.
In the long term, the use of required raw materials, may stimulate agricultural production, improving its standard and benefitting the poorer rural population.
In the short term, moreover, setting up the plant will generate work for engineers, labourers, builders, etc.

Technology transfer

For the proposed project to optimize the use of human resources, labour will have to be well trained, this enhancing the skills of the factory workers.

It is important also to point out that a new advanced technology will be acquired by the Country.

CHAPTER X

TABLES

CHAP. X - TAB . 1

PRODUCTION OF BABY FOODS IN THE FIRST THREE YEARS

OF ACTIVITY OF THE PLANT

	FIRST YEAR	SECOND YEAR	THIRD YEAR
PWF1	172	343	520
PWF2	175	350	530
HPSC	294	587	890
MISC	294	587	890
TOTAL (TONS)	935	1867	2830

CHAP. X - TAB. 2

RAW MATERIAL QUANTITIES

PWF1

QUANTITY: 520 TONS

RAW MATERIAL	KILOS PER TONS
Rice	725
Skimmed milk powder	200
Sugar	150
Calcium	4
Vitamins	,42
Iron	,09

MISC

QUANTITY: 890 TONS

RAW MATERIAL	KILOS PER TONS
Maize	420
Wheat	320
Rice	180
Sugar	80
Salt	20
Cocoa	30
Calcium	4
Vitamins	,42
Iron	,09

PWF2

QUANTITY: 530 TONS

RAW MATERIAL	KILOS PER TONS
Maize	528
Soy	332
Rice	264
Sugar	100
Oil	50
Calcium	4
Vitamins	,42
Iron	,09

HPSC

QUANTITY: 890 TONS

RAW MATERIAL	KILOS PER TONS
Rice	610
Soy	320
Sugar	80
Salt	20
Malt	20
Calcium	4
Vitamins	,42
Iron	,09

CHAP. X - TAB. 3

COST OF UTILITIES PER PRODUCT

ASSUMPTIONS	FACTORY WORKING DAYS	FACTORY HOURS	SHIFTS	FACTORY TOTAL HOURS
PWF1 (520 T)	42	336	3	1008
PWF2 (530 T)	56	448	3	1344
MISC (890 T)	91	728	3	2184
HPSC (890 T)	91	728	3	2184

WATER	REQUIREMENT lt/hour	FACTORY WORKING HOURS	TOTAL REQUIR. c.meter	UNIT US$/c. meter	TOTAL VALUE US$
PWF1 (520 T)	250	1008	252	4	1008
PWF2 (530 T)	250	1344	336	4	1344
MISC (890 T)	250	2184	546	4	2184
HPSC (890 T)	250	2184	546	4	2184
			TOTAL		6720

ELECTRICITY	POWER REQUIR. km/h	FACTORY WORKING HOURS	TOTAL POWER REQUIREMENT kw/h	UNIT PRICE US$/kwh	TOTAL VALUE US$
PWF1 (520 T)	367	1008	369936	,1	36993
PWF2 (530 T)	367	1344	493248	,1	49325
MISC (890 T)	367	2184	801528	,1	80153
HPSC (890 T)	367	2184	801528	,1	80153
		TOTAL			246624

FUEL	FUEL REQUIR. lt/h	FACTORY WORKING HOURS	TOTAL FUEL REQUIR. lt	UNIT PRICE US$/lt	TOTAL VALUE US$
PWF1 (520 T)	75	1008	75600	,22	16632
PWF2 (530 T)	75	1344	100800	,22	22176
MISC (890 T)	75	2184	163800	,22	36036
HPSC (890 T)	75	2184	163800	,22	36036
			TOTAL		110880

CHAP. X - TAB. 4

MANPOWER QUANTITIES AND COSTS

ADMINISTRATION	NO.	ANNUAL LABOUR COST
Factory Manager	1	12.857
Administrative assist.	2	9.214
Secretary	1	3.600
Messanger	1	2.006
Driver/Utility	1	2.006
		29.683
FINANCE		
Chief Accountant	1	7.714
Accounting Supervisor	1	4.607
Accounting Clarks	3	2.671
		14.992
MARKETING		
Marketing Manager	1	10.285
Assist. Brand Manager	1	6.685
Secretary	1	3.600
		20.570
PRODUCTION		
Production Head	1	7.714
Production Supervisor	4	18.428
Skilled Workers	10	26.714
Unskilled workers	20	32.091
		84.947
WAREHOUSE		
Supervisor	1	4.607
Skilled Workers	1	2.671
Unskilled Workers	1	1.605
		13.961
LABORATORY		
Supervisor	1	4.607
Analyst	2	5.343
Semi-Skilled Worker	2	4.011
		13.961

MAINTENANCE/UTILITIES

Supervisor	2	9.214
Skilled Workers	5	13.358
Semi-skilled Workers	2	4.011
Unskilled Workers	2	3.209
		29.792
GRAND TOTAL	68	202.828

CHAP. X - TAB. 5a

DIRECT COSTS PER PRODUCT FOR THE FIRST YEAR

PRODUCT	PWF1 (T 172)	PWF2 (T 175)	HPSC (T 294)	MISC (T 294)	TOTAL (T 935)
Raw materials	163.400	103.250	220.500	135.240	622.390
Conf. Materials	50.396	51.275	86.142	86.142	273.955
Utilities	336	448	728	728	2.240
Energy	17.875	23.834	38.730	38.730	119.160
Labour direct	12.464	12.736	21.454	21.454	68.108
Advertising	35.000	59.000	54.500	44.500	193.000
TOTAL	279.471	250.543	422.054	326.794	1.278.853
UNIT COST PER TON	1625	1432	1435	1112	

CHAP. X - TAB. 5b

DIRECT COST PER PRODUCT FOR THE SECOND YEAR

PRODUCT	PWF1 (T343)	PWF2 (T350)	HPSC (T587)	MISC (T587)	TOTAL (T1.867)
Raw material	325.850	206.500	440.250	270.020	1.242.620
Conf. "	100.499	102.550	171.991	171.991	547.031
Utilities	672	896	1.456	1.456	4.480
Energy	35.714	47.619	77.382	77.382	238.097
Labour direct	17.219	17.596	29.640	29.640	94.095
Advertising	63.000	98.000	97.000	79.000	337.000
UNIT COST PER TON	1583	1352	1393	1072	

CHAP. X - TAB. 5c

DIRECT COST PER PRODUCT FOR THE THIRD AND NEXT YEARS

PRODUCT	PWF1 (T520)	PWF2 (530)	HPSC (T890)	MISC (T890)	TOTAL (T2.830)
Raw material	494,000	312.700	667.500	409.400	1.883.600
Conf.material	152.360	155.290	260.770	260.770	829.190
Utilities	1.008	1.344	2.184	2.184	6.720
Energy	53.625	71.501	116.189	116.189	357.504
Labour direct	20.997	21.456	36.143	36.143	114.739
Advertising	71.000	99.000	110.000	90.000	370.000
TOTAL	792.990	661.291	1.192.786	914.686	3.561.753
UNIT COST PER TON	1525	1248	1340	1028	

FINANCIAL PLAN (A)
COMFAR TABLES

Project Filippine
December 1991
++++++++++

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: USD (thousand)

Total initial investment during construction phase

fixed assets:	6300.00	78.254 % foreign
current assets:	300.00	0.000 % foreign
total assets:	6600.00	74.697 % foreign

Source of funds during construction phase

equity & grants:	2620.00	9.542 % foreign
foreign loans :	3980.00	
local loans :	0.00	
total funds :	6600.00	64.091 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	1243.70	2320.09	3519.35
depreciation :	602.50	602.50	602.50
interest :	398.00	381.42	315.08
production costs	2244.20	3304.01	4436.93
thereof foreign	31.10 %	16.27 %	9.87 %
total sales :	1734.60	3836.90	5816.00
gross income :	-702.60	195.89	1009.07
net income :	-702.60	127.33	655.90
cash balance :	-261.18	-78.64	426.08
net cashflow :	136.82	966.11	1404.50

Net Present Value at: 10.00 % = 2915.50
Internal Rate of Return: 16.11 %
Return on equity1: 17.37 %
Return on equity2: 19.49 %

Index of Schedules produced by COMFAR

TAB. 1 A

Total Initial Investment in USD (thousand)

Year	1992
Fixed investment costs	
Land, site preparation, development	380.000
Buildings and civil works	430.000
Auxiliary and service facilities	320.000
Incorporated fixed assets	0.000
Plant machinery and equipment	5110.000
Total fixed investment costs	6240.000
Pre-production capital expenditures.	60.000
Net working capital	300.000
Total initial investment costs	6600.000
Of it foreign, in %	74.697

TAB. 2 A

Total Current Investment in USD (thousand)

Year	1993	1994	1995	1996
Fixed investment costs				
Land, site preparation, development	0.000	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	0.000	0.000
Total fixed investment costs	0.000	0.000	0.000	0.000
Preproduction capitals expenditures.	0.000	0.000	0.000	0.000
Working capital	161.080	145.136	168.982	-0.000
Total current investment costs	161.080	145.136	168.982	-0.000
Of it foreign, %	0.000	0.000	0.000	0.000

TAB. 3.1 A

Total Production Costs in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000- 2
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Raw material 1	622.390	1242.620	1883.600	1883.600	1883.600	1883.600	1883.600	1883.600
Other raw materials	273.955	547.031	829.190	829.190	829.190	829.190	829.190	829.190
Utilities	2.240	4.480	6.720	6.720	6.720	6.720	6.720	6.720
Energy	119.139	238.097	357.504	357.504	357.504	357.504	357.504	357.504
Labour, direct	68.108	94.095	114.739	114.739	114.739	114.739	114.739	114.739
Repair, maintenance	18.600	18.600	18.600	18.600	18.600	18.600	18.600	18.600
Spares	0.000	0.000	99.900	99.900	99.900	99.900	99.900	99.900
Factory overheads	44.594	44.594	44.594	44.594	44.594	44.594	44.594	44.594
Factory costs	1149.026	2189.517	3354.847	3354.847	3354.847	3354.847	3354.847	3354.847
Administrative overheads	57.805	73.805	88.830	88.830	88.830	88.830	88.830	88.830
Indir. costs, sales and distribution	36.870	56.770	75.670	75.670	75.670	75.670	75.670	75.670
Direct costs, sales and distribution	193.000	337.000	370.000	370.000	370.000	370.000	370.000	370.000
Depreciation	602.500	602.500	602.500	602.500	602.500	554.500	554.500	554.500
Financial costs	398.000	381.417	315.083	248.750	182.417	116.083	49.750	0.000
Total production costs	2437.201	3641.009	4806.931	4740.597	4674.263	4559.930	4493.597	4443.847
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	36.558	24.016	16.811	15.647	14.450	13.357	12.078	11.094
Of it variable,%	7.919	9.256	7.697	7.805	7.916	8.114	8.234	8.326
Total labour	133.353	159.340	179.984	179.984	179.984	179.984	179.984	179.984

TAB. 3.2 A

Total Production Costs in USD (thousand)

Year	2003- 7
% of nom. capacity (single product).	0.000
Raw material 1	1883.600
Other raw materials	829.190
Utilities	6.720
Energy	357.504
Labour, direct	114.739
Repair, maintenance	18.600
Spares	99.900
Factory overheads	44.594
Factory costs	3354.847
Administrative overheads	88.830
Indir. costs, sales and distribution	75.670
Direct costs, sales and distribution	370.000
Depreciation	29.500
Financial costs	0.000
Total production costs	3918.847
Costs per unit (single product)	0.000
Of it foreign, %	0.000
Of it variable,%	9.442
Total labour	179.984

TAB. 4 A

Net Working Capital in USD (thousand)

Year	mdc	coto	1993	1994	1995	1996-2007
Coverage						
Current assets &						
Accounts receivable	30	12.0	119.725	221.424	324.112	324.112
Inventory and materials	35	10.4	386.297	472.304	561.175	561.175
Energy	0	---	0.000	0.000	0.000	0.000
Spares	90	4.0	0.000	0.000	24.975	24.975
Work in progress	0	---	0.000	0.000	0.000	0.000
Finished products	15	24.0	50.285	94.305	143.487	143.487
Cash in hand	1	360.0	0.525	0.642	1.019	1.019
Total current assets			556.832	788.675	1054.768	1054.768
Current liabilities and						
Accounts payable	30	12.0	95.752	182.460	279.571	279.571
Net working capital			461.080	606.215	775.197	775.197
Increase in working capital			161.080	145.136	168.982	-0.000
Net working capital, local			461.080	606.215	775.197	775.197
Net working capital, foreign			0.000	0.000	0.000	0.000

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

TAB. 5.1 A

Source of Finance, construction in USD (thousand)

Year	1992
Equity, ordinary	2620.000
Equity, preference	0.000
Subsidies, grants	0.000
Loan A, foreign	3980.000
Loan B, foreign	0.000
Loan C, foreign	0.000
Loan A, local	0.000
Loan B, local	0.000
Loan C, local	0.000
Total loan	3980.000
Current liabilities	0.000
Bank overdraft	0.000
Total funds	6600.000

TAB. 5.2 A

Source of Finance, production in USD (thousand)

Year	1993	1994	1995	1996-99
Equity, ordinary ..	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000
Loan A, foreign .	0.000	-663.333	-663.333	-663.333
Loan B, foreign..	0.000	0.000	0.000	0.000
Loan C, foreign .	0.000	0.000	0.000	0.000
Loan A, local....	0.000	0.000	0.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000
Total loan	0.000	-663.333	-663.333	-663.333
Current liabilities	95.752	86.708	97.111	0.000
Bank overdraft	261.181	78.639	-339.820	0.000
Total funds	356.933	-497.987	-906.043	-663.333

Cashflow Tables, construction in USD (thousand)

Year	1992
Total cash inflow	6600.000
Financial resources	6600.000
Sales, net of tax	0.000
Total cash outflow	6600.000
Total assets	6600.000
Operating costs	0.000
Cost of finance	0.000
Repayment	0.000
Corporate tax	0.000
Dividends paid	0.000
Surplus (deficit)	0.000
Cumulated cash balance	0.000
Inflow, local	2370.000
Outflow, local	1670.000
Surplus (deficit)	700.000
Inflow, foreign	4230.000
Outflow, foreign	4930.000
Surplus (deficit)	-700.000
Net cashflow	-6600.000
Cumulated net cashflow	-6600.000

TAB. 6.2 A

Cashflow tables, production in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total cash inflow	1830.352	3923.607	5913.111	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Financial resources	95.752	86.708	97.111	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	1734.600	3836.900	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Total cash outflow	2091.533	4002.248	5487.032	5177.821	5134.705	5108.388	5065.271	4369.600	4369.600
Total assets	256.832	231.843	266.093	-0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	1436.701	2657.092	3889.348	3889.347	3889.347	3889.347	3889.347	3889.347	3889.347
Cost of finance	398.000	381.417	315.083	248.750	182.417	116.083	49.750	0.000	0.000
Repayment	0.000	663.333	663.333	663.333	663.333	663.333	663.333	0.000	0.000
Corporate tax	0.000	68.562	353.174	376.391	399.608	439.624	462.841	480.253	480.253
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-261.180	-78.640	426.079	638.179	681.295	707.612	750.729	1446.400	1446.400
Cumulated cash balance	-261.180	-339.821	86.259	724.437	1405.733	2113.345	2864.074	4310.474	5756.874
Inflow, local	1830.352	3923.607	5913.111	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Outflow, local	1693.533	2957.498	4508.615	4265.738	4288.955	4328.971	4352.188	4369.600	4369.600
Surplus (deficit)	136.820	966.110	1404.496	1550.262	1527.045	1487.029	1463.813	1446.400	1446.400
Inflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Outflow, foreign	398.000	1044.750	978.417	912.083	845.750	779.417	713.083	0.000	0.000
Surplus (deficit)	-398.000	-1044.750	-978.417	-912.083	-845.750	-779.417	-713.083	-0.000	0.000
Net cashflow	136.819	966.110	1404.496	1550.262	1527.046	1487.029	1463.812	1446.400	1446.400
Cumulated net cashflow	-6463.181	-5497.071	-4092.575	-2542.313	-1015.267	471.762	1935.575	3381.975	4828.375

TAB. 6.3 A

Cashflow tables, production in USD (thousand)

Year	2002	2003	2004	2005	2006	2007
Total cash inflow	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Total cash outflow	4369.600	4553.350	4553.350	4553.350	4553.350	4553.350
Total assets	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	3889.347	3889.347	3889.347	3889.347	3889.347	3889.347
Cost of finance	0.000	0.000	0.000	0.000	0.000	0.000
Repayment	0.000	0.000	0.000	0.000	0.000	0.000
Corporate tax	480.253	664.004	664.004	664.004	664.004	664.004
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	1446.400	1262.650	1262.650	1262.650	1262.650	1262.650
Cumulated cash balance	7203.273	8465.924	9728.574	10991.220	12253.880	13516.530
Inflow, local	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Outflow, local	4369.600	4553.350	4553.350	4553.350	4553.350	4553.350
Surplus (deficit)	1446.400	1262.650	1262.650	1262.650	1262.650	1262.650
Inflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Outflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	0.000	0.000	0.000	0.000	0.000	0.000
Net cashflow	1446.400	1262.650	1262.650	1262.650	1262.650	1262.650
Cumulated net cashflow	6274.774	7537.424	8800.074	10062.720	11325.370	12588.020

Cashflow Discounting:

a) Equity paid versus Net income flow:
Net present value ..... 2119.93 at 10.00 %
Internal Rate of Return (IRRE1) .. 17.37 %

b) Net Worth versus Net cash return:
Net present value ..... 2981.16 at 10.00 %
Internal Rate of Return (IRRE2) .. 19.49 %

c) Internal Rate of Return on total investment:
Net present value ..... 2915.50 at 10.00 %
Internal Rate of Return (IRR) .. 16.11 %

Net Worth = Equity paid plus reserves

TAB. 8.1 A — COMFAR 2.1 - PAVAN MAPIMPIANTI SPA., GALLIERA VENETA

Net Income Statement in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000
Total sales, incl. sales tax	1734.600	3836.900	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Less: variable costs, incl. sales tax.	193.000	337.000	370.000	370.000	370.000	370.000	370.000	370.000
Variable margin	1541.600	3499.900	5446.000	5446.000	5446.000	5446.000	5446.000	5446.000
As % of total sales	88.874	91.217	93.638	93.638	93.638	93.638	93.638	93.638
Non-variable costs, incl. depreciation	1846.201	2922.592	4121.847	4121.847	4121.847	4073.847	4073.847	4073.847
Operational margin	-304.601	577.308	1324.153	1324.153	1324.153	1372.153	1372.153	1372.153
As % of total sales	-17.560	15.046	22.767	22.767	22.767	23.593	23.593	23.593
Cost of finance	398.000	381.417	315.083	248.750	182.417	116.083	49.750	0.000
Gross profit	-702.601	195.891	1009.069	1075.403	1141.736	1256.069	1322.403	1372.153
Allowances	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-702.601	195.891	1009.069	1075.403	1141.736	1256.069	1322.403	1372.153
Tax	0.000	68.562	353.174	376.391	399.608	439.624	462.841	480.253
Net profit	-702.601	127.329	655.895	699.012	742.129	816.445	859.562	891.899
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-702.601	127.329	655.895	699.012	742.129	816.445	859.562	891.899
Accumulated undistributed profit	-702.601	-575.272	80.623	779.635	1521.764	2338.209	3197.771	4089.670
Gross profit, % of total sales	-40.505	5.105	17.350	18.490	19.631	21.597	22.737	23.593
Net profit, % of total sales	-40.505	3.319	11.277	12.019	12.760	14.038	14.779	15.335
ROE, Net profit, % of equity	-26.817	4.860	25.034	26.680	28.326	31.162	32.808	34.042
ROI, Net profit+interest, % of invest.	-4.505	7.366	13.724	13.396	13.067	13.180	12.852	12.606

TAB. 8.2 A — COMFAR 2.1 - PAVAN MAPIMPIANTI SPA., GALLIERA VENETA

Net Income Statement in USD (thousand)

Year	2001	2002	2003	2004	2005	2006	2007
Total sales, incl. sales tax	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Less: variable costs, incl. sales tax.	370.000	370.000	370.000	370.000	370.000	370.000	370.000
Variable margin	5446.000	5446.000	5446.000	5446.000	5446.000	5446.000	5446.000
As % of total sales	93.638	93.638	93.638	93.638	93.638	93.638	93.638
Non-variable costs, incl. depreciation	4073.847	4073.847	3548.847	3548.847	3548.847	3548.847	3548.847
Operational margin	1372.153	1372.153	1897.153	1897.153	1897.153	1897.153	1897.153
As % of total sales	23.593	23.593	32.620	32.620	32.620	32.620	32.620
Cost of finance	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross profit	1372.153	1372.153	1897.153	1897.153	1897.153	1897.153	1897.153
Allowances	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	1372.153	1372.153	1897.153	1897.153	1897.153	1897.153	1897.153
Tax	480.253	480.253	664.004	664.004	664.004	664.004	664.004
Net profit	891.899	891.899	1233.149	1233.149	1233.149	1233.149	1233.149
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	891.899	891.899	1233.149	1233.149	1233.149	1233.149	1233.149
Accumulated undistributed profit	4981.569	5873.469	7106.618	8339.768	9572.917	10806.070	12039.220
Gross profit, % of total sales	23.593	23.593	32.620	32.620	32.620	32.620	32.620
Net profit, % of total sales	15.335	15.335	21.203	21.203	21.203	21.203	21.203
ROE, Net profit, % of equity	34.042	34.042	47.067	47.067	47.067	47.067	47.067
ROI, Net profit+interest, % of invest.	12.606	12.606	17.429	17.429	17.429	17.429	17.429

Projected Balance Sheets, construction in USD (thousand)

Year	1992
Total assets	6600.000
Fixed assets, net of depreciation	0.000
Construction in progress	6300.000
Current assets	300.000
Cash, bank	0.000
Cash surplus, finance available	0.000
Loss carried forward	0.000
Loss	0.000
Total liabilities	6600.000
Equity capital	2620.000
Reserves, retained profit	0.000
Profit	0.000
Long and medium term debt	3980.000
Current liabilities	0.000
Bank overdraft, finance required.	0.000
Total debt	3980.000
Equity, % of liabilities	39.697

TAB. 9.2 A

Projected Balance Sheets, Production in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000
Total assets	6956.933	6586.276	6208.799	5669.207	5748.001	5901.113	6017.342	6989.240
Fixed assets, net of depreciation	5697.500	5095.000	4492.500	3890.000	3287.500	2735.000	2178.500	1624.000
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	556.307	788.033	1053.749	1053.749	1053.749	1053.749	1053.749	1053.749
Cash, bank	0.525	0.642	1.019	1.019	1.019	1.019	1.019	1.019
Cash surplus, finance available	0.000	0.000	86.260	724.439	1405.734	2113.345	2864.074	4310.473
Loss carried forward	0.000	702.601	575.272	0.000	0.000	0.000	0.000	0.000
Loss	702.601	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	6956.933	6586.276	6208.799	5669.207	5748.001	5901.113	6017.342	6989.241
Equity capital	2620.000	2620.000	2620.000	2620.000	2620.000	2620.000	2620.000	2620.000
Reserves, retained profit	0.000	0.000	0.000	80.623	779.635	1521.764	2318.209	3197.771
Profit	0.000	127.329	655.895	699.012	742.129	816.445	859.562	891.899
Long and medium term debt	3980.000	3316.667	2653.333	1990.000	1326.667	663.334	0.000	0.000
Current liabilities	95.752	182.460	279.571	279.571	279.571	279.571	219.571	279.571
Bank overdraft, finance required	261.181	339.820	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	4336.934	3838.947	2932.904	2269.571	1606.238	942.904	219.571	279.571
Equity, % of liabilities	37.660	39.780	42.198	46.215	45.581	44.398	42.970	37.486

TAB. 9.3 A

Projected Balance Sheets, Production in USD (thousand)

Year	2001	2002	2003	2004	2005	2006	2007
Total assets	7881.140	8773.039	10006.190	11239.340	12472.490	13705.640	14938.790
Fixed assets, net of depreciation	1069.500	515.000	485.500	456.000	426.500	397.000	367.500
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1053.749	1053.749	1053.749	1053.749	1053.749	1053.749	1053.749
Cash, bank	1.019	1.019	1.019	1.019	1.019	1.019	1.019
Cash surplus, finance available	5756.872	7203.271	8465.921	9728.570	10991.220	12253.870	13516.520
Loss carried forward	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	7881.140	8773.039	10006.190	11239.340	12472.490	13705.640	14938.790
Equity capital	2620.000	2620.000	2620.000	2620.000	2620.000	2620.000	2620.000
Reserves, retained profit	4089.670	4981.569	5873.469	7106.618	8339.768	9572.917	10806.070
Profit	891.899	891.899	1233.149	1233.149	1233.149	1233.149	1233.149
Long and medium term debt	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current liabilities	279.571	279.571	279.571	279.571	279.571	279.571	279.571
Bank overdraft, finance required	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	279.571	279.571	279.571	279.571	279.571	279.571	279.571
Equity, % of liabilities	33.244	29.864	26.184	23.311	21.006	19.116	17.538

TAB. 10 A

VALUES chart description [FILIPPIN] — COMFAR 2.1 - PAVAN MAPIMPIANTI SPIL., GALLIERA VENETA

Sensitivity of IRR
internal rate of return

	sales price	operating c	initial inv	
-20.0	-4.47	24.53	20.41	16.11
-19.0	-2.92	24.14	20.16	
-18.0	-1.47	23.74	19.91	
-17.0	-0.11	23.35	19.67	
-16.0	1.17	22.95	19.43	
-15.0	2.38	22.55	19.19	
-14.0	3.53	22.14	18.96	
-13.0	4.63	21.73	18.74	
-12.0	5.69	21.32	18.51	
-11.0	6.70	20.91	18.29	
-10.0	7.68	20.49	18.08	
-9.0	8.63	20.07	17.87	
-8.0	9.55	19.65	17.66	
-7.0	10.44	19.22	17.46	
-6.0	11.31	18.79	17.25	
-4.0	12.98	17.91	16.86	
-3.0	13.79	17.47	16.67	
-2.0	14.58	17.02	16.48	
-1.0	15.35	16.57	16.29	
0.0	16.11	16.11	16.11	
1.0	16.86	15.65	15.93	
2.0	17.59	15.18	15.75	
3.0	18.31	14.71	15.58	
4.0	19.02	14.23	15.40	
5.0	19.72	13.74	15.23	
6.0	20.41	13.25	15.06	
7.0	21.09	12.76	14.90	
8.0	21.76	12.25	14.74	
9.0	22.42	11.74	14.57	
10.0	23.07	11.22	14.42	
12.0	24.36	10.16	14.10	
13.0	24.99	9.62	13.95	
14.0	25.61	9.06	13.80	
15.0	26.23	8.50	13.65	
16.0	26.85	7.93	13.50	
17.0	27.45	7.34	13.36	
18.0	28.06	6.74	13.22	
19.0	28.65	6.13	13.07	
20.0	29.24	5.51	12.93	
21.0	29.83	4.87	12.80	
22.0	30.41	4.22	12.66	
23.0	30.99	3.54	12.52	
24.0	31.56	2.85	12.39	
25.0	32.13	2.14	12.26	
26.0	32.69	1.41	12.13	
28.0	33.81	-0.12	11.87	
29.0	34.36	-0.93	11.75	

-- variation in %

FIG. 1

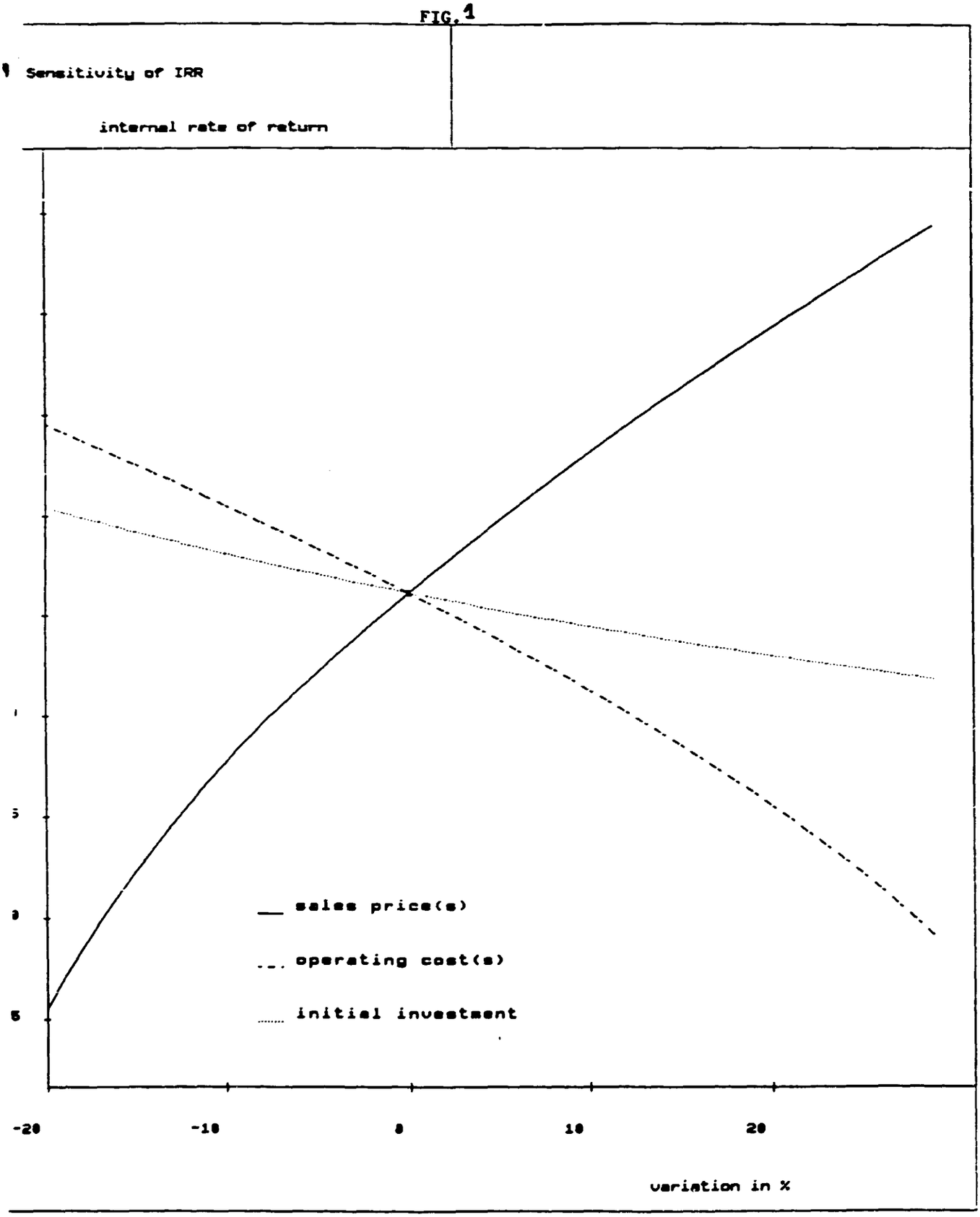
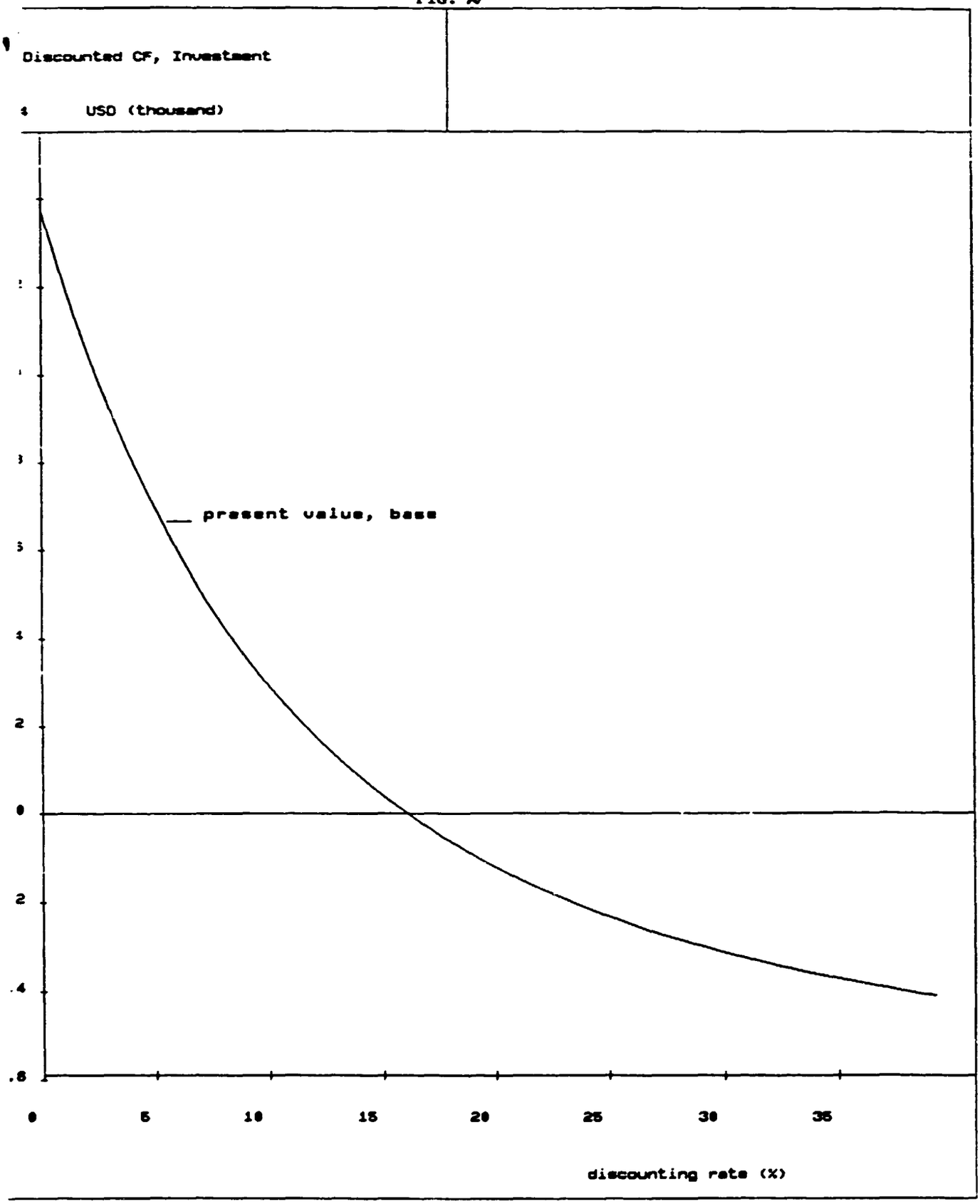

Sensitivity of IRR
internal rate of return
sales price(s)
operating cost(s)
initial investment
-20
-10
0
10
20
variation in %

FIG. 2


Discounted CF, Investment
USD (thousand)
present value, base
0
5
10
15
20
25
30
35
discounting rate (%)

----------COMFAR 2.1 - PAVAN MAPIMPIANTI SPA., GALLIERA VENETA -----

FIG. 3

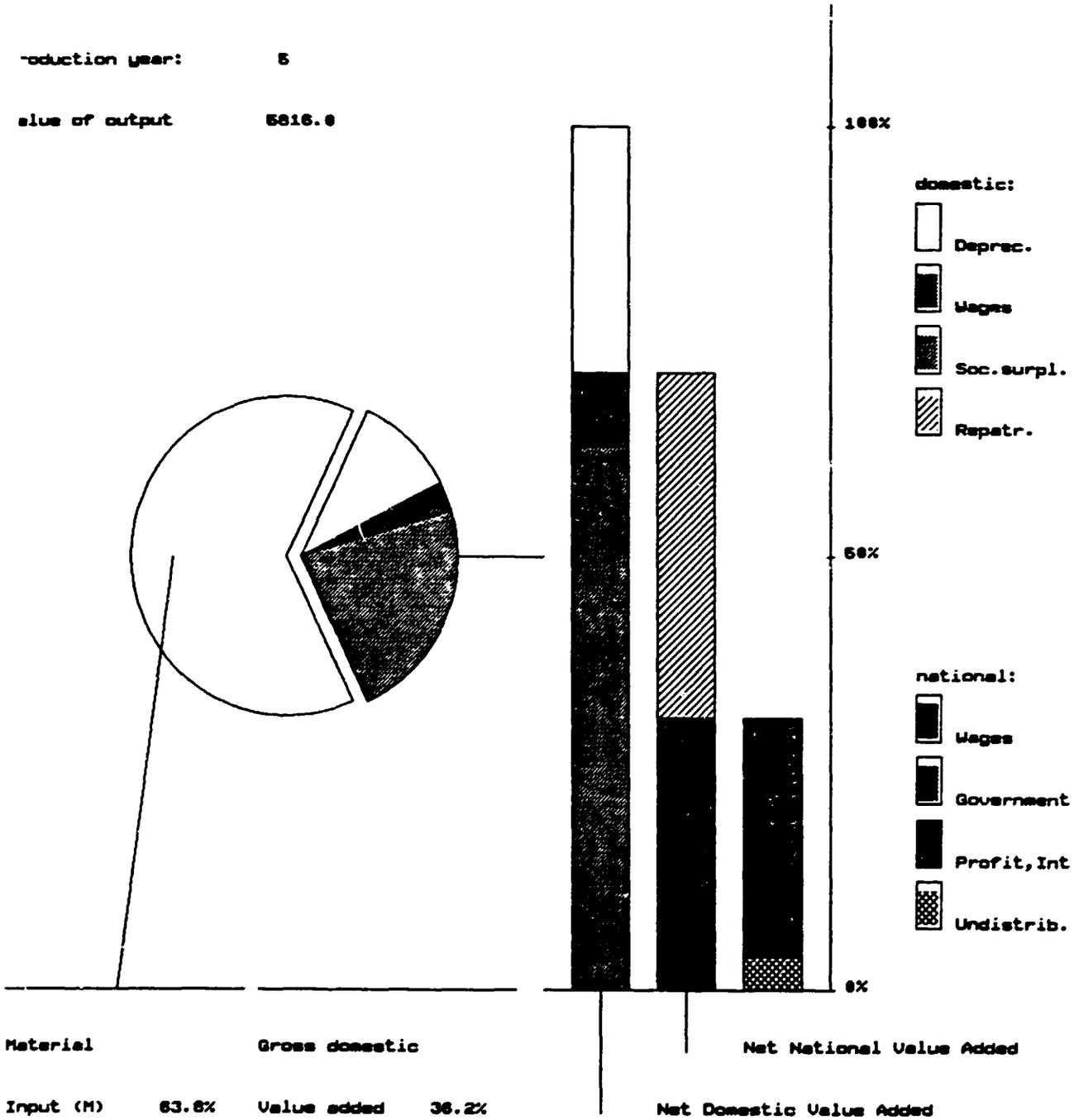
Structure of value added

million us dollar

for 5th production year

-oduction year: 5

alue of output 5816.8



Material Input (M) 63.8% 3709.4

Gross domestic Value added 36.2% 2106.6

Net National Value Added

Net Domestic Value Added

Gross Domestic Value Added

FINANCIAL PLAN (B)
COMFAR TABLES

Project Filippine
December 1991
++++++++++

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: USD (thousand)

Total initial investment during construction phase

fixed assets:	6300.00	78.254 % foreign
current assets:	300.00	0.000 % foreign
total assets:	6600.00	74.697 % foreign

Source of funds during construction phase

equity & grants:	3965.00	46.154 % foreign
foreign loans :	2635.00	
local loans :	0.00	
total funds :	6600.00	67.652 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	1243.70	2320.09	3519.35
depreciation :	602.50	602.50	602.50
interest :	263.50	252.52	208.60
production costs	2109.70	3175.11	4330.45
thereof foreign	26.71 %	12.87 %	7.66 %
total sales :	1734.60	3836.90	5816.00
gross income :	-568.10	324.79	1115.55
net income :	-568.10	211.11	725.11
cash balance :	-126.68	229.31	719.46
net cashflow :	136.82	921.00	1367.23

Net Present Value at: 10.00 % = 2805.95
Internal Rate of Return: 15.86 %
Return on equity1: 20.19 %
Return on equity2: 26.19 %

Index of Schedules produced by COMFAR

TAB. 1 B

tal Initial Investment in USD (thousand)

r	1992
ed investment costs	
nd, site preparation, development	380.000
ildings and civil works	430.000
xiliary and service facilities	320.000
corporated fixed assets	0.000
ant machinery and equipment	5110.000
al fixed investment costs	6240.000
-production capital expenditures.	60.000
working capital	300.000
al initial investment costs	6600.000
it foreign, in %	74.697

TAB. 2 B

›tal Current Investment in USD (thousand)

ır	1993	1994	1995	1996
·ed investment costs				
ınd, site preparation, development	0.000	0.000	0.000	0.000
ıildings and civil works	0.000	0.000	0.000	0.000
ıxiliary and service facilities .	0.000	0.000	0.000	0.000
ıcorporated fixed assets	0.000	0.000	0.000	0.000
lant, machinery and equipment . .	0.000	0.000	0.000	0.000
tal fixed investment costs	0.000	0.000	0.000	0.000
·production capitals expenditures.	0.000	0.000	0.000	0.000
·king capital	161.080	145.136	168.982	-0.000
·al current investment costs . . .	161.080	145.136	168.982	-0.000
it foreign, %	0.000	0.000	0.000	0.000

TAB. 3.1 B — COMFAR 2.1 - PAVAN MAPIMPIANTI SPA., GALLIERA VENETA

Total Production Costs in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000- 2
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Raw material 1	622.390	1242.620	1883.600	1883.600	1883.600	1883.600	1883.600	1883.600
Other raw materials	273.955	547.031	829.190	829.190	829.190	829.190	829.190	829.190
Utilities	2.240	4.480	6.720	6.720	6.720	6.720	6.720	6.720
Energy	119.139	238.097	357.504	357.504	357.504	357.504	357.504	357.504
Labour, direct	68.108	94.095	114.739	114.739	114.739	114.739	114.739	114.739
Repair, maintenance	18.600	18.600	18.600	18.600	18.600	18.600	18.600	18.600
Spares	0.000	0.000	99.900	99.900	99.900	99.900	99.900	99.900
Factory overheads	44.594	44.594	44.594	44.594	44.594	44.594	44.594	44.594
Factory costs	1149.026	2189.517	3354.847	3354.847	3354.847	3354.847	3354.847	3354.847
Administrative overheads	57.805	73.805	88.830	88.830	88.830	88.830	88.830	88.830
Indir. costs, sales and distribution	36.870	56.770	75.670	75.670	75.670	75.670	75.670	75.670
Direct costs, sales and distribution	193.000	337.000	370.000	370.000	370.000	370.000	370.000	370.000
Depreciation	602.500	602.500	602.500	602.500	602.500	554.500	554.500	554.500
Financial costs	263.500	252.521	208.604	164.687	120.771	76.854	32.938	-0.000
Total production costs	2302.701	3512.113	4700.451	4656.534	4612.618	4520.701	4476.784	4443.847
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	32.853	21.227	14.926	14.124	13.306	12.605	11.748	11.094
Of it variable,%	8.381	9.595	7.872	7.946	8.021	8.185	8.265	8.326
Total labour	133.353	159.340	179.984	179.984	179.984	179.984	179.984	179.984

Total Production Costs in USD (thousand)

Year	2003- 7
% of nom. capacity (single product).	0.000
Raw material 1	1883.600
Other raw materials	829.190
Utilities	6.720
Energy	357.504
Labour, direct	114.739
Repair, maintenance	18.600
Spares	99.900
Factory overheads	44.594
Factory costs	3354.847
Administrative overheads	88.830
Indir. costs, sales and distribution	75.670
Direct costs, sales and distribution	370.000
Depreciation	29.500
Financial costs	0.000
Total production costs	3918.847
Costs per unit (single product)	0.000
Of it foreign, %	0.000
Of it variable,%	9.442
Total labour	179.984

TAB. 4 B

Net Working Capital in USD (thousand)

Year	mdc	coto	1993	1994	1995	1996-2007
Coverage						
Current assets &						
Accounts receivable	30	12.0	119.725	221.424	324.112	324.112
Inventory and materials	35	10.4	386.297	472.304	561.175	561.175
Energy	0	---	0.000	0.000	0.000	0.000
Spares	90	4.0	0.000	0.000	24.975	24.975
Work in progress	0	---	0.000	0.000	0.000	0.000
Finished products	15	24.0	50.285	94.305	143.487	143.487
Cash in hand	1	360.0	0.525	0.642	1.019	1.019
Total current assets			556.832	788.675	1054.768	1054.768
Current liabilities and						
Accounts payable	30	12.0	95.752	182.460	279.571	279.571
Net working capital			461.080	606.215	775.197	775.197
Increase in working capital			161.080	145.136	168.982	-0.000
Net working capital, local			461.080	606.215	775.197	775.197
Net working capital, foreign			0.000	0.000	0.000	0.000

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in USD (thousand)

Year	1992
Equity, ordinary ..	2385.000
Equity, preference.	0.000
Subsidies, grants .	1580.000
Loan A, foreign .	2635.000
Loan B, foreign..	0.000
Loan C, foreign .	0.000
Loan A, local....	0.000
Loan B, local....	0.000
Loan C, local....	0.000
Total loan	2635.000
Current liabilities	0.000
Bank overdraft	0.000
Total funds	6600.000

TAB. 5.2 B

Source of Finance, production in USD (thousand)

Year	1993	1994	1995	1996-99
Equity, ordinary	0.000	0.000	0.000	0.000
Equity, preference	0.000	0.000	0.000	0.000
Subsidies, grants	0.000	0.000	0.000	0.000
Loan A, foreign	0.000	-439.167	-439.167	-439.167
Loan B, foreign	0.000	0.000	0.000	0.000
Loan C, foreign	0.000	0.000	0.000	0.000
Loan A, local	0.000	0.000	0.000	0.000
Loan B, local	0.000	0.000	0.000	0.000
Loan C, local	0.000	0.000	0.000	0.000
Total loan	0.000	-439.167	-439.167	-439.167
Current liabilities	95.752	86.708	97.111	0.000
Bank overdraft	126.681	-126.681	0.000	0.000
Total funds	222.433	-479.140	-342.056	-439.167

Cashflow Tables, construction in USD (thousand)

Year	1992
Total cash inflow . .	6600.000
Financial resources .	6600.000
Sales, net of tax . .	0.000
Total cash outflow . .	6600.000
Total assets	6600.000
Operating costs . . .	0.000
Cost of finance . . .	0.000
Repayment	0.000
Corporate tax . . .	0.000
Dividends paid . . .	0.000
Surplus (deficit) .	0.000
Cumulated cash balance	0.000
Inflow, local	2135.000
Outflow, local	1670.000
Surplus (deficit) .	465.000
Inflow, foreign . . .	4465.000
Outflow, foreign . . .	4930.000
Surplus (deficit) .	-465.000
Net cashflow	-6600.000
Cumulated net cashflow	-6600.000

TAB. 6.2 B

Cashflow tables, production in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total cash inflow	1830.352	3923.607	5913.111	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Financial resources	95.752	86.708	97.111	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	1734.600	3836.900	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Total cash outflow	1957.033	3694.299	5193.653	4899.014	4870.468	4858.722	4830.177	4369.600	4369.600
Total assets	256.832	231.843	266.093	-0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	1436.701	2657.092	3889.348	3889.347	3889.347	3889.347	3889.347	3889.347	3889.347
Cost of finance	263.500	252.521	208.604	164.687	120.771	76.854	32.938	-0.000	0.000
Repayment	0.000	439.167	439.167	439.167	439.167	439.167	439.167	0.000	0.000
Corporate tax	0.000	113.675	390.442	405.813	421.184	453.355	468.725	480.253	480.253
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-126.681	229.309	719.458	916.986	945.532	957.278	985.823	1446.400	1446.400
Cumulated cash balance	-126.681	102.628	822.086	1739.073	2684.605	3641.883	4627.706	6074.106	7520.506
Inflow, local	1830.352	3923.607	5913.111	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Outflow, local	1693.533	3002.611	4545.882	4295.160	4310.530	4342.701	4358.072	4369.600	4369.600
Surplus (deficit)	136.819	920.996	1367.229	1520.840	1505.470	1473.299	1457.928	1446.400	1446.400
Inflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Outflow, foreign	263.500	691.688	647.771	603.854	559.938	516.021	472.104	-0.000	0.000
Surplus (deficit)	-263.500	-691.688	-647.771	-603.854	-559.938	-516.021	-472.104	0.000	0.000
Net cashflow	136.819	920.996	1367.229	1520.840	1505.470	1473.299	1457.928	1446.400	1446.400
Cumulated net cashflow	-6463.181	-5542.184	-4174.956	-2654.115	-1148.646	324.653	1782.581	3228.981	4675.381

Cashflow tables, production in USD (thousand)

Year	2002	2003	2004	2005	2006	2007
Total cash inflow	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Total cash outflow	4369.600	4553.350	4553.350	4553.350	4553.350	4553.350
Total assets	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	3889.347	3889.347	3889.347	3889.347	3889.347	3889.347
Cost of finance	0.000	0.000	0.000	0.000	0.000	0.000
Repayment	0.000	0.000	0.000	0.000	0.000	0.000
Corporate tax	480.253	664.004	664.004	664.004	664.004	664.004
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	1446.400	1262.650	1262.650	1262.650	1262.650	1262.650
Cumulated cash balance	8966.906	10229.560	11492.210	12754.860	14017.510	15280.160
Inflow, local	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Outflow, local	4369.600	4553.350	4553.350	4553.350	4553.350	4553.350
Surplus (deficit)	1446.400	1262.650	1262.650	1262.650	1262.650	1262.650
Inflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Outflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	0.000	0.000	0.000	0.000	0.000	0.000
Net cashflow	1446.400	1262.650	1262.650	1262.650	1262.650	1262.650
Cumulated net cashflow	6121.781	7384.431	8647.080	9909.729	11172.380	12435.030

Cashflow Discounting:

a) Equity paid versus Net income flow:
Net present value ..... 2680.65 at 10.00 %
Internal Rate of Return (IRRE1) .. 20.19 %
b) Net Worth versus Net cash return:
Net present value ..... 4429.42 at 10.00 %
Internal Rate of Return (IRRE2) .. 26.19 %
c) Internal Rate of Return on total investment:
Net present value ..... 2805.95 at 10.00 %
Internal Rate of Return (IRR) .. 15.86 %
Net Worth = Equity paid plus reserves

TAB. 8.1 B

Net Income Statement in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000
Total sales, incl. sales tax	1734.600	3836.900	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Less: variable costs, incl. sales tax.	193.000	337.000	370.000	370.000	370.000	370.000	370.000	370.000
Variable margin	1541.600	3499.900	5446.000	5446.000	5446.000	5446.000	5446.000	5446.000
As % of total sales	88.874	91.217	93.638	93.638	93.638	93.638	93.638	93.638
Non-variable costs, incl. depreciation	1846.201	2922.592	4121.848	4121.847	4121.847	4073.847	4073.847	4073.847
Operational margin	-304.601	577.308	1324.152	1324.153	1324.153	1372.153	1372.153	1372.153
As % of total sales	-17.560	15.046	22.767	22.767	22.767	23.593	23.593	23.593
Cost of finance	263.500	252.521	208.604	164.687	120.771	76.854	32.938	-0.000
Gross profit	-568.101	324.787	1115.548	1159.465	1203.382	1295.299	1339.215	1372.153
Allowances	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-568.101	324.787	1115.548	1159.465	1203.382	1295.299	1339.215	1372.153
Tax	0.000	113.675	390.442	405.813	421.184	453.355	468.725	480.253
Net profit	-568.101	211.112	725.106	753.652	782.198	841.944	870.490	891.899
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-568.101	211.112	725.106	753.652	782.198	841.944	870.490	891.899
Accumulated undistributed profit	-568.101	-356.989	368.117	1121.770	1903.968	2745.912	3616.402	4508.301
Gross profit, % of total sales	-32.751	8.465	19.181	19.936	20.691	22.271	23.026	23.593
Net profit, % of total sales	-32.751	5.502	12.467	12.958	13.449	14.476	14.967	15.335
ROE, Net profit, % of equity	-23.820	8.852	30.403	31.600	32.797	35.302	36.499	37.396
ROI, Net profit+interest, % of invest.	-4.505	6.713	13.197	12.980	12.762	12.986	12.769	12.606

TAB. 8.2 B

Net Income Statement in USD (thousand)

Year	2001	2002	2003	2004	2005	2006	2007
Total sales, incl. sales tax	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000	5816.000
Less: variable costs, incl. sales tax.	370.000	370.000	370.000	370.000	370.000	370.000	370.000
Variable margin	5446.000	5446.000	5446.000	5446.000	5446.000	5446.000	5446.000
As % of total sales	93.638	93.638	93.638	93.638	93.638	93.638	93.638
Non-variable costs, incl. depreciation	4073.847	4073.847	3548.847	3548.847	3548.847	3548.847	3548.847
Operational margin	1372.153	1372.153	1897.153	1897.153	1897.153	1897.153	1897.153
As % of total sales	23.593	23.593	32.620	32.620	32.620	32.620	32.620
Cost of finance	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross profit	1372.153	1372.153	1897.153	1897.153	1897.153	1897.153	1897.153
Allowances	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	1372.153	1372.153	1897.153	1897.153	1897.153	1897.153	1897.153
Tax	480.253	480.253	664.004	664.004	664.004	664.004	664.004
Net profit	891.899	891.899	1233.149	1233.149	1233.149	1233.149	1233.149
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	891.899	891.899	1233.149	1233.149	1233.149	1233.149	1233.149
Accumulated undistributed profit	5400.201	6292.100	7525.250	8758.398	9991.548	11224.700	12457.850
Gross profit, % of total sales	23.593	23.593	32.620	32.620	32.620	32.620	32.620
Net profit, % of total sales	15.335	15.335	21.203	21.203	21.203	21.203	21.203
ROE, Net profit, % of equity	37.396	37.396	51.704	51.704	51.704	51.704	51.704
ROI, Net profit+interest, % of invest.	12.606	12.606	17.429	17.429	17.429	17.429	17.429

Projected Balance Sheets, construction in USD (thousand)

Year	1992
Total assets	6600.000
Fixed assets, net of depreciation	0.000
Construction in progress	6300.000
Current assets	300.000
Cash, bank	0.000
Cash surplus, finance available	0.000
Loss carried forward	0.000
Loss	0.000
Total liabilities	6600.000
Equity capital	3965.000
Reserves, retained profit	0.000
Profit	0.000
Long and medium term debt	2635.000
Current liabilities	0.000
Bank overdraft, finance required	0.000
Total debt	2635.000
Equity, % of liabilities	60.076

TAB. 9.2 B

Projected Balance Sheets, Production in USD (thousand)

Year	1993	1994	1995	1996	1997	1998	1999	2000
Total assets	6822.433	6554.405	6726.344	6683.840	7026.872	7429.649	7860.973	8752.872
Fixed assets, net of depreciation	5697.500	5095.000	4492.500	3890.000	3287.500	2733.000	2178.500	1624.000
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	556.307	788.033	1053.749	1053.749	1053.749	1053.749	1053.749	1053.749
Cash, bank	0.525	0.642	1.019	1.019	1.019	1.019	1.019	1.019
Cash surplus, finance available	0.000	102.629	822.087	1739.073	2684.604	3641.882	4627.705	6074.104
Loss carried forward	0.000	568.101	356.989	0.000	0.000	0.000	0.000	0.000
Loss	568.101	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	6822.433	6554.405	6726.344	6683.840	7026.872	7429.649	7860.973	8752.872
Equity capital	3965.000	3965.000	3965.000	3965.000	3965.000	3965.000	3965.000	3965.000
Reserves, retained profit	0.000	0.000	0.000	368.117	1121.770	1903.968	2745.912	3616.402
Profit	0.000	211.112	725.106	753.652	782.198	841.944	870.490	891.899
Long and medium term debt	2635.000	2195.833	1756.667	1317.500	878.333	439.167	-0.000	-0.000
Current liabilities	95.752	182.460	279.571	279.571	279.571	279.571	279.571	279.571
Bank overdraft, finance required.	126.681	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	2857.433	2378.293	2036.237	1597.071	1157.904	718.737	279.571	279.571
Equity, % of liabilities	58.117	60.494	58.947	59.322	56.426	53.367	50.439	45.299

TAB. 9.3 B

Projected Balance Sheets, Production in USD (thousand)

Year	2001	2002	2003	2004	2005	2006	2007
Total assets	9644.771	10536.670	11769.820	13002.970	14236.120	15469.270	16702.420
Fixed assets, net of depreciation	1069.500	515.000	485.500	456.000	426.500	397.000	367.500
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1053.749	1053.749	1053.749	1053.749	1053.749	1053.749	1053.749
Cash, bank	1.019	1.019	1.019	1.019	1.019	1.019	1.019
Cash surplus, finance available	7520.503	8966.903	10229.550	11492.200	12754.850	14017.500	15280.150
Loss carried forward	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	9644.771	10536.670	11769.820	13002.970	14236.120	15469.270	16702.420
Equity capital	3965.000	3965.000	3965.000	3965.000	3965.000	3965.000	3965.000
Reserves, retained profit	4508.301	5400.201	6292.100	7525.250	8758.398	9991.548	11224.700
Profit	891.899	891.899	1233.149	1233.149	1233.149	1233.149	1233.149
Long and medium term debt	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Current liabilities	279.571	279.571	279.571	279.571	279.571	279.571	279.571
Bank overdraft, finance required.	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	279.571	279.571	279.571	279.571	279.571	279.571	279.571
Equity, % of liabilities	41.110	37.630	33.688	30.493	27.852	25.631	23.739

TAB. 10 B

UES chart description [FILIPPIN]

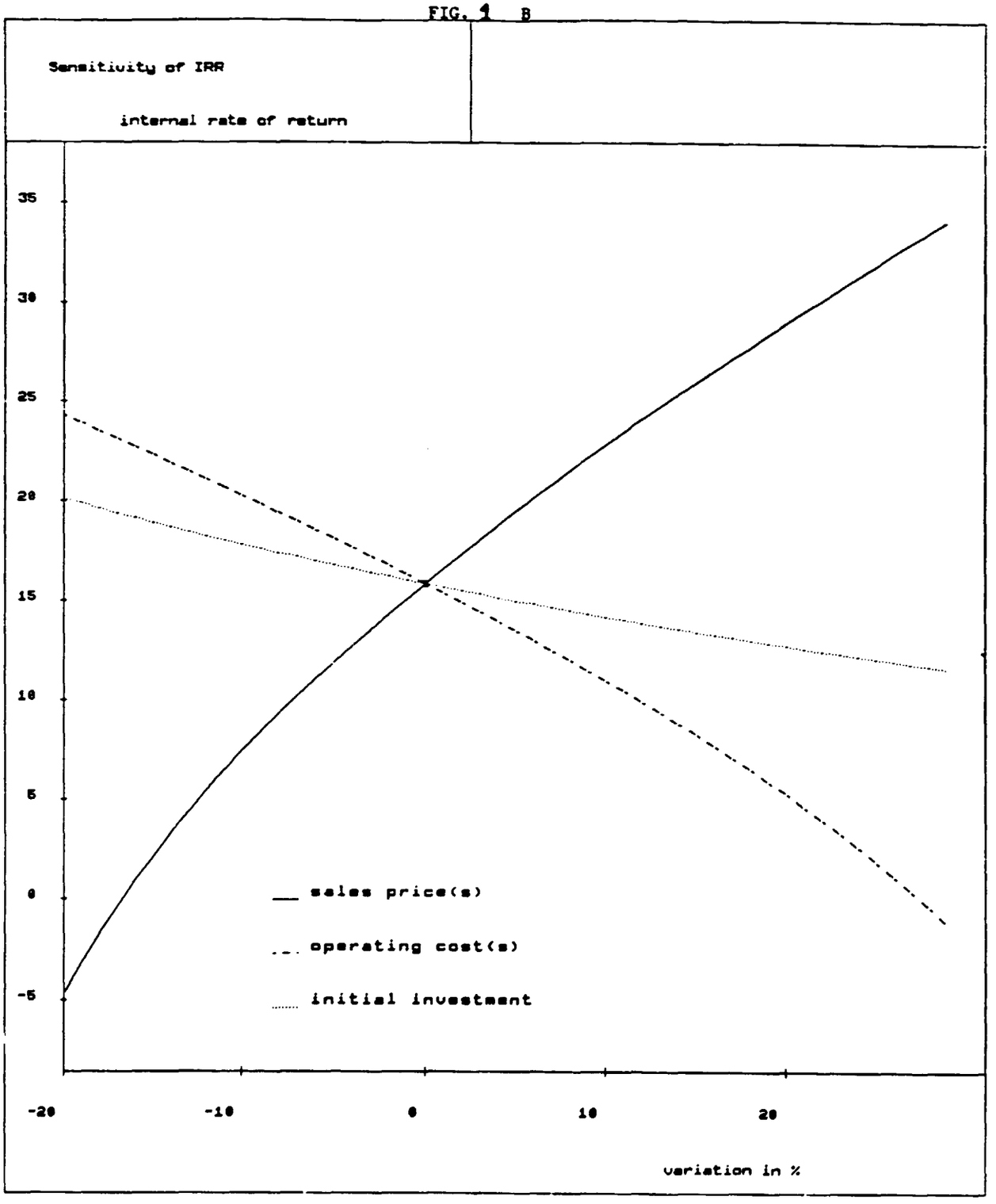
ensitivity of IRR
internal rate of return

	sales price	operating c	initial inv	
-20.0	-4.71	24.28	20.10	15.86
-19.0	-3.16	23.89	19.85	
-18.0	-1.71	23.49	19.60	
-17.0	-0.36	23.09	19.36	
-16.0	0.92	22.70	19.13	
-15.0	2.13	22.29	18.90	
-14.0	3.28	21.89	18.67	
-13.0	4.38	21.48	18.45	
-12.0	5.44	21.07	18.23	
-11.0	6.45	20.66	18.01	
-10.0	7.43	20.24	17.80	
-9.0	8.38	19.82	17.59	
-8.0	9.30	19.39	17.39	
-7.0	10.19	18.97	17.19	
-6.0	11.06	18.54	16.99	
-4.0	12.73	17.66	16.60	
-3.0	13.54	17.22	16.41	
-2.0	14.33	16.77	16.22	
-1.0	15.10	16.32	16.04	
0.0	15.86	15.86	15.86	
1.0	16.60	15.40	15.68	
2.0	17.34	14.93	15.51	
3.0	18.06	14.46	15.33	
4.0	18.77	13.98	15.16	
5.0	19.47	13.49	14.99	
6.0	20.15	13.00	14.83	
7.0	20.83	12.51	14.66	
8.0	21.50	12.00	14.50	
9.0	22.17	11.49	14.34	
10.0	22.82	10.97	14.19	
12.0	24.10	9.91	13.88	
13.0	24.74	9.37	13.73	
14.0	25.36	8.81	13.58	
15.0	25.98	8.25	13.43	
16.0	26.59	7.68	13.29	
17.0	27.20	7.09	13.14	
18.0	27.80	6.49	13.00	
19.0	28.40	5.88	12.86	
20.0	28.99	5.26	12.72	
21.0	29.58	4.62	12.59	
22.0	30.16	3.97	12.45	
23.0	30.74	3.30	12.32	
24.0	31.31	2.61	12.19	
25.0	31.88	1.90	12.06	
26.0	32.44	1.17	11.93	
28.0	33.56	-0.37	11.68	
29.0	34.11	-1.18	11.55	

** variation in %

----------CCMFAR 2.1 - PAVAN MAPIMPIANTI SPA., GALLIERA VENETA -----

FIG. 1 B



----------CCMFAR 2.1 - PAVAN MAPIMPIANTI SPA., GALLIERA VENETA -----

FIG. 8 B

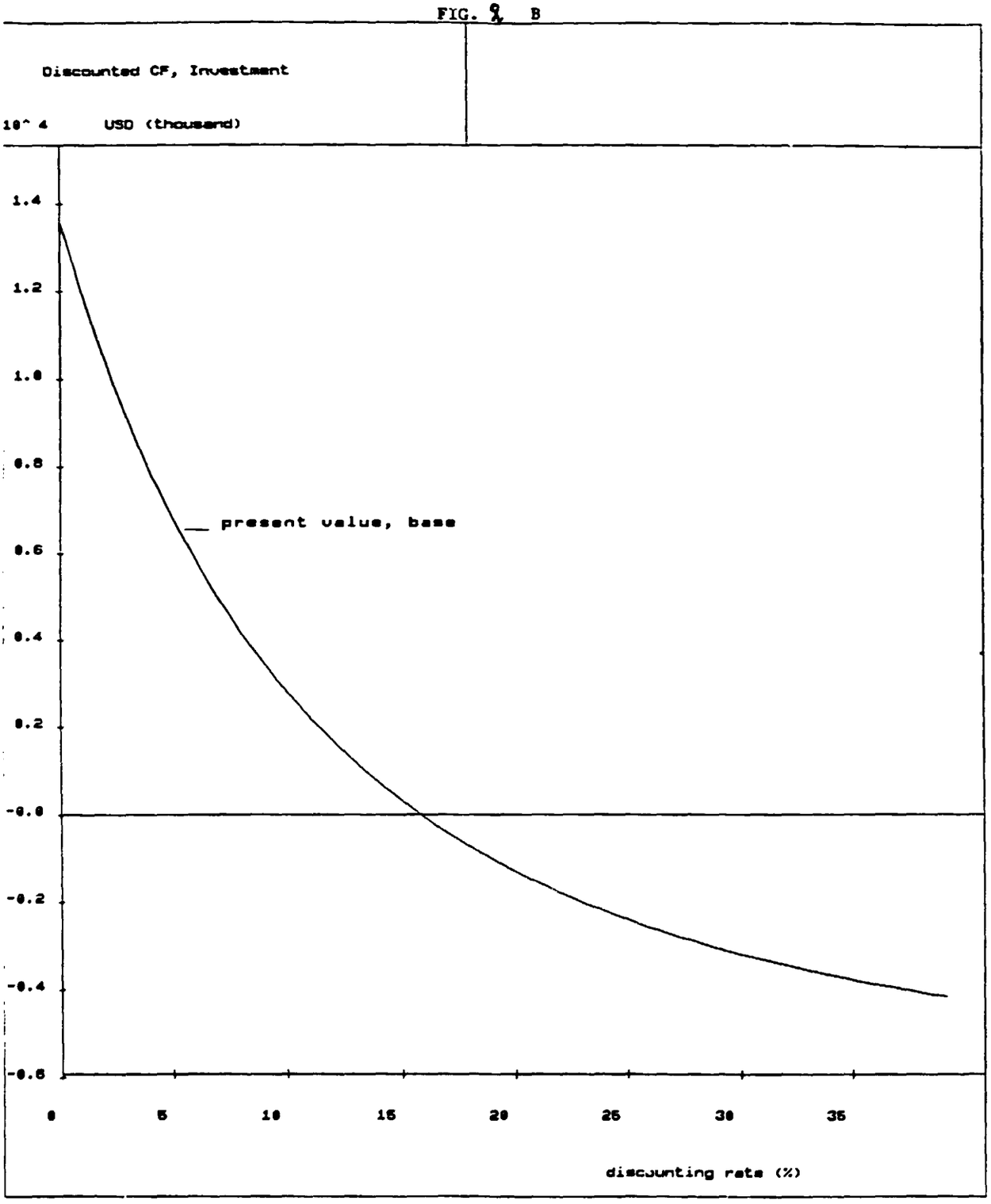
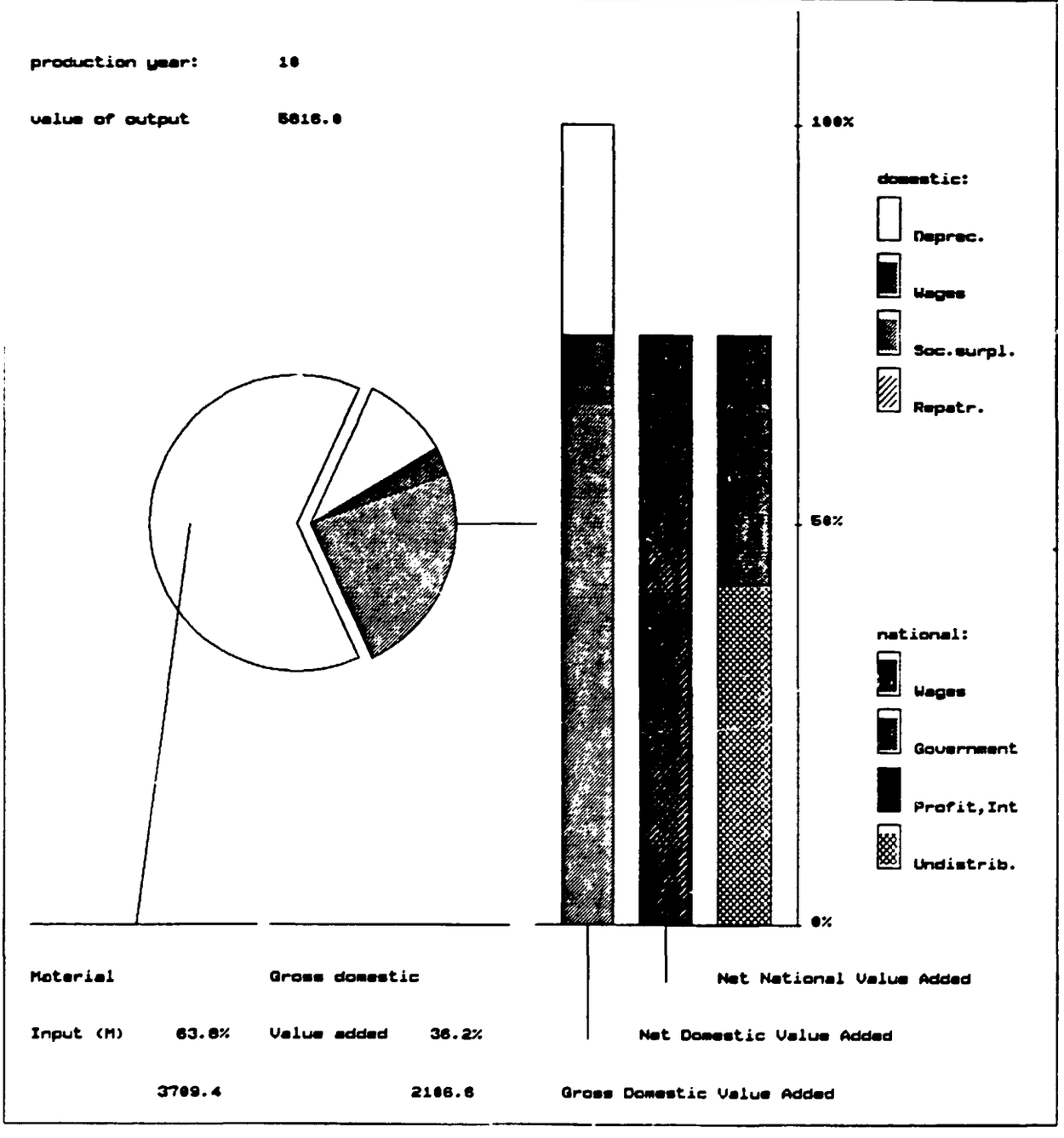


FIG. 3 B

Structure of value added

million us dollar

for 10th production year



APPENDIX I

Final Product Specifications

APPENDIX I - FINAL PRODUCT SPECIFICATIONS

A - Specifications of finished products (PWF1, PWF2, MSC, HPSC)

B - Analysis and evaluation of products currently marketed in the Philippines.

This appendix covers the specifications of the finished products to be produced at GMC factory. These specifications refer to the definition of the product, its physical and functional characteristics, composition and nutritional requirements.

The second part of this appendix covers the analysis and evaluation of the products currently available on the Philipino market.

This appendix has been included in the present study to evaluate and compare the nutritional aspects and the organoleptic characteristics of the products to be produced by GMC and the products actually present in the Philippines.

FINISHED PRODUCT SPECIFICATIONS

A) Precooked Weaning Food

1. Definition

A dry product based on precooked cereals flour and milk solids should not require further cooking.
It can be given to infants from about 4 months to 3 years old and is the first introduction to semi-solid food.

2. Sensory characteristics

Appearance: a uniform pale cream to light golden brown colour, free of burnt material. It should consist of granules or fine particles with minimal fine dusty material. It should be free of caked lumps and be free flowing.

When reconstitued it should be uniform in colour and no segregation of fat or watery material should occur.

Texture: the product when reconstitued should taste uniformly smooth and should not contain gritty particles or lumps. It should be viscous or pasty but not to such an extent that it is difficult for the baby to swallow it.

Flavour: No burnt, musty or rancid off-flavours should occur with a fairly strong vanilla flavour (or alternatively added flavour if desired). It should not taste salty and should be free of sour or bitter notes.

3. Physical and Functional Characteristics

Particle Size Distribution (PSD): The following data will serve as a provisional specification:

- retained in 600 microns 1% max
- passed through 500 microns 95% min

Bulk density: The range should be 0.45-0.55 g/ml.

Water Dispersibility and Absorption:

The product should diperse well in lukewarm water without forming lumps. It should absorb water and thicken readily within 2-3 minutes.

4.Composition and Nutritional Requirements.

The major nutrients will be present at the follwing levels:

	PWF1	PWF2
	g/100 g dry product	l
Fat	2,5%	6,5%
Protein	12,5%	18,0%
Carbohydrates	80	70
Energy content	390 kcal	410kcal

Energy and protein needs of a child aged 1-3 years and 13 kg in weight are given by WHO as 1,360 Kcals and 16 g protein per day. Hence 100 g of PWF2 will provide almost all the protein required and one third of the calories. The fat in PWF2 consists mainly of vegetable oil (5g).

Essential amino acids are provided adequately by the milk and cereal protein for PWF1 and from DSF and cereals for PWF2.

Moisture content should be below 6.5%.

Microbiology:	
total plate count	3000/g
coliform	less than 10/g
salmonella	absent in 25 g
yeast and moulds	less than 10/g

5. Vitamin and Mineral Requirements

The recommended daily intakes of the major micronutrients for a 1-3 year old child are as follows (WHO 1985):

Vitamins	Minerals
A 800 IU (250 mcg)	Calcium 500 mg
D 400 IU (10 mcg)	Iron 10 mg
B1 0.5 mg	
B2 0.8 mg	
Niacin 9.0 mg	
Folic acid 50 mcg*	
B12 0.3 mcg*	
C 20 mg	

* Revised downwards in 1985.

It is assumed that the daily intake of PWF1 or PWF2 will reach a maximum of 100 g during the period from 6 months to 3 years since the child will still be receiving milk in the early stages and a variety of solid food should gradually be introduced as the child grows older.

Hence the supply of the RDI levels in 100 g will be more than adequate and will compensate for poor supply of micronutrients from the baby's other food sources and will give a boost to body reserves if the PWF is fed occasionally rather than every day.

The contributions from the ingredients in the formulations will be taken into consideration for the formulation of the mineral vitamin premix.

Supplementation levels may require adjustment once analyses of ingredients and allowance for processing and shelf time losess are made.

INFANT SHAPED CEREALS

Description

This type of product has been conceived to be ready to be consumed (no need for further cooking) at breakfast, alone or with milk and during the day as a snack.
Better nutritional value can be achieved by the proper formulation granted by the possibility of integration of high protein flours such as leguminous flours (defatted soy flour) with cereals which can also satisfy the amino acids balance requirements.
A wide range of shapes that can stimulate the consumers combined with the wide possibility of formulations (sweet or salted) can provide a good turn-over of the products.
Longer shelf-life of the product can be achieved due to the low moisture content (i.e. below 3.0%)

The following are some proposed nutritional analysis:

	g/100 of day product shaped multicereal	high protein
fat	1%	1%
protein	7.5%	18%
carbohydrates	85%	72%
energy	370 Kcal	370Kcal

Vitamin supplementation can be done by spraying non heat stable vitamins on the semifinished product or adding heat stable vitamins in the flour premix, to guarantee sufficient vitamin intake for the consumers.

Sensory characteristics:

Appearance: expanded product of defined shapes (i.c. letters, grids, etc.)

Texture: crispy or crunchy without any indication of grittiness or sogginess when eaten alone and maintain their crispiness for a certain period when consumed with milk.

Taste: typical taste of toasted cereals with no rancid taste or any off-flavour, during the shelf-life period. They can be coated with sugar or similar, vegetable oil, or chocolate to improve consumer acceptability.

RESULTS OF ANALYSISIS ON THE MOST REPRESENTATIVES PRODUCTS EXISTING ON THE MARKET

BABY FOODS:

1. Cerelac (wheat) - Nestlé
Locally manufactured by NESTLE' PHILIPPINES, INC., Laguna

Ingredients:

wheat flour (partially hydrolyzed)
skimmed milk powder
sugar
butter oil
corn oil
calcium carbonate
salt
lecithin
ferrous fumarate
vanillin
vitamins A,D, E,C,B1,B2,B6,B12, PP
pantothenic acid
biotin
folic acid

Average composition:	**per 100 g powder**
moisture, g	2.5
fat, g	9.0
protein, g	15.5
carbohydrates, g	68.8
dietary fibre, g	1.7
mineral salts,g	2.5
energy value kcal	418.25
linoleate, g	1.2
vitamin A (40% as pro-vitamin A),IU	1030
vitamin D3, IU	200.0
vitamin E, IU	
vitamin C, mg	35.0
folic acid, mcg	22.5
thiamine (B1), mg	0.3
riboflavin (B2), mg	0.3
niacin (PP), mg	4.0
vitamin B6, mg	0.3
vitamin B12, mcg	0.75
biotin, mcg	
pantothenic acid, mg	1.5
calcium, mg	400.0
phosphorous, mg	320.0
iron, mg	7.5
sodium, mg	180.0
potassium, mg	650.0

Physical properties:

bulk density, g/l	471	
viscosity, B.U. (11%)	400	at 26-C

2. Gerber Rice Cereal

Ingredients:

Rice flour
Soy oil
lecithin
Tri and dicalcium phosphate
electrolytic iron
niacinamide
riboflavin (vit. B2)
thiamin (vit. B1)

Average composition:	**per 100 g powder**
protein, g	7.1
carbohydrates, g	77.6
fat, g	7.1
sodium, g	0
calories, Kcal	423.3
Physical properties:	
bulk density, g/l	198
viscosity, B.U	300 at 28-C (11%)
Vitamins:	**% RDA (us)**
thiamin (vit.B1)	45
riboflavin (vit.B2)	45
niancin	25
calcium	15
iron	45
vitamin B6	4
phosphorus	10

3. Rice Cereal - Golden Diamond

Locally manufactured by Golden Diamond Manufacturing Corporation, Metro Manila

Ingredients:

rice flour
wheat flour
coconut oil
lecithin
tricalcium phosphate
iron

thiamine
riboflavin

Average composition	**per 100 g powder**
moisture, g	6.80
protein, g	10.00
fat, g	2.40
mineral, g	2.45
crude fibre,g	0.25
carbohydrates, g	78.10
energy, Kcal	360
Vitamins and minerals	**per 100 g**
vitamin B1, mg	1.8
vitamin B2, mg	1.6
niacinamide, mg	14.1
calcium, mg	120.0
phosphorus, mg	480.0
iron, mg	20.5

Physical properties:

bulk density, g/l	197
viscosity, B.U	580 at 28-C (11%)

4. Baby Rice - Milupa,
Imported by Alliance Dairy Distributors Manila, Philippines

Ingredients:

ready cooked rice flakes

Average composition	**per 100 g powder**
protein	7.0
fat	1.0
carbohydrates	83.0
energy, Kcal	369

Physical properties:

bulk density, g/l	143
viscosity, B.u	810 at 27-C (7%)

5. Mixed Cereal with Bananas - Gerber
Manufactured by Gerber products Co., Fremont MI, USA

Ingredients:

Fully ripened bananas
rice flour
corn flour
oat flour
wheat flour
soy protein concentrate
sugar
tri and dicalcium phosphate
soy oil
lecithin
electrolytic iron
niacin
riboflavin (vit.B2)
thiamin (vit. B1)

Average composition	**per 100 g powder**
protein, g	7.1
carbohydrates, g	77.6
fat, g	7.1
sodium, mg	70.5
calories, Kcal	423.3

Vitamins:	**% RDA (US)**
thiamin (vit. B1)	45
riboflavin (vit. B2)	45
niacin	25
calcium	15
iron	45
vitamin B6	8
phosphorus	10

Physical properties:

bulk density, g/l	222
viscosity, B.U	1040 at 25-C (11%)

INFANT SHAPED CEREALS

1. **Sporties (rice, wheat and milo)** **Nestle'**
   Imported by Nutritional products SDN.BHD, Petaling Java.

   Appearance: ring shaped product, brownish in colour with an external sugar-cocoa coating.

   Ingredients:

   rice flour
   sugar
   whole wheat flour
   malt extract
   cocoa powder
   skimmed milk powder
   palm kernel oil
   full cream milk powder
   palm oil
   salt
   mineral salts

Vitamin and mineral content	per 100 g....
vitamin A, IU	2000
vitamin C, mg	50
vitamin B1, mg	1.2
vitamin B2, mg	1.4
Niacin, mg	16.0
Vitamin B6	1.7
iron, mg	12.0

2. Honey stars (corn, wheat and honey coated), Nestle'

Imported by Nutritional Products SDN.BHD, Petaling Java

Appearance: three-pointed star shaped, yellowish in colour and with an external sugar based coating.

Ingredients:

corn flour
wheat flour
sugar
palm kernel oil
honey
malt extract
skimmed milk powder
salt

Vitamin and mineral content	per 100 g of product
vitamin A, IU	2000
vitamin C, mg	50
vitamin B1, mg	1.2
vitamin B2, mg	1.4
niacin, mg	16.0
vitamin B6, mg	1.7
iron, mg	12.0

3. **Rice plus (brown rice and wheat), Nestlè**
Manufactured by Nestlé Singapore (PTE) Ltd - Singapore

Appearance: Olympic ring-like shaped product, creamish in colour

Ingredients:

brown rice
wheat flour
sugar
rice flour
malt extract
rice bran
palm kernel oil
salt

Average composition:	**per 100 g**
energy value, Kcal	389
protein,g	11.2
fat, g	3.8
carbohydrate, g	77.6
dietary fibre, g	3.1
mineral, g	3.8
moisture,g	0.5

Vitamins and mineral content	**per 100 g**
vitamin A, mg	2085
vitamin C, mg	50
vitamin B1, mg	1.2
vitamin B2, mg	1.4
niacin, mg	16
vitamin B6, mg	1.7
iron, mg	12

4. Cocoa puffs (chocolatey crisp, breakfast cereals), Gourmand
Locally manufactured by BBB EDAMS INC., Filippine

Appearance: expanded flattenes rice shaped product externally coated with sugar-cocoa mix.

Ingredients:

rice
sugar
cocoa
malt extract
salt
vegetable oil
vitamins and minerals

Average content	**per 60 g**
protein	4.8
fat	0.6
sucrose + other sugars	17.0
total carbohydrates	52.4
energy value	230 Kcal

5. Froot loopes (orange, lemon and flavoured cereals), Kellog's
Imported by Sysu international, Inc.Metro Manila.

Appearance: multi-coloured ring shaped product with an external sugar coating

Ingredients:

corn flour
wheat flour
barley flour
sugar
salt
vegetable oil
erythrosine
sunset yellow FCT
tartrazine
iron
vitamins

Average composition	per 100 g
water,g	5.0
protein,g	5.5
fat,g	0.9
carbohydrate,g	86.1
ash,g	2.5
calorie,Kcal	374
vitamin A, I.U.	1.900
vitamin B1,mg	1.2
vitamin B2,mg	1.2
vitamin C,mg	63
niacin, mg	17.6
iron,mg	6.35

APPENDIX II

Specific Project Opportunity: Pasta Market

APPENDIX II - Specific project opportunity: Pasta market

Premise

While carrying out the market research in the Philippines for infant foods, some interesting considerations were made also on other food products, i.e. pasta.
Therefore, Pavan Mapimpianti and GMC, who is a pasta producer in the Philippines, investigated this market segment in order to evaluate a specific project opportunity for the expansion of GMC production capacity.

Introduction

Pasta has been considered on account of its worldwide growing reputation as "global food", suitable to the most varied requirements and market conditions.
Reports indicate that pasta is consumed by all the family members,including school-age children, which could represent stage 3 of nutritional program.

From the market and commercial point of view, it is worth mentioning that one of the major food producers in the Philippines, Universal Robina Corp. is massively present in 3 of the segments analyzed by this study, i.e. pasta, snacks, and breakfast cereals.

1. The market of pasta worldwide

In the last decade, the consumption rate of pasta has been increasing year after year and shows a positive trend for the coming future.
In the USA only, for example, the estimated rate of pro-capita consumption is 10% per annum, which means that in 2000 the US market will be of 3.800.000 tons for a value of 8 billion US dollars.
All the market researches on this subject indicate some characteristics that are applicable in all countries, either belonging to the industrialized area or to the developing one.

1. Analyzing the consumers of pasta by age, the major share include the young population from 14 to 29 years.

2. Demographic factors such as the increase in the number of families and the decrease of the number of the family members - which extreme is represented by the single-member family - help the consumption of one-course meals.

3. A more detailed and spread knowledge about Italian cooking, due to the proliferation of Italian Restaurants all over the world, plays an important role for the consumer's bigger familiarity with pasta.

4. The new image of pasta as a healthy food, by means of the winning model of the Mediterranean diet, has further fostered the consumption development.

5.Last but not least, pasta (in its dried form) is not perishable, enjoys a long shelf life, which on one side stimulates the family buying process in the developed countries; on the other hand, it represents the ideal solution for storage and distribution organization in the developing countries.

2.The offer of pasta products worldwide

In the last few years, the trend that generally applies to the food industry is characterized by a very high number of acquisition and mergers among the food producers.
Consequently, a few multinational companies control the market of pasta production.
This small group of the "big" producers is led by Borden Inc. that, holding a 32% share of the U.S. market, is the biggest producer of pasta in the world.
To the same group belong Barilla, BSN, Hershey, Bunge Borne, Nestlé-Buitoni, Heinz, and CPC.
Very lately, the pasta market has been entered by "new comers" such as Pepsico, Unilever, Cargill, and other big corporations.
Therefore, the offer in the single markets is very much concentrated and, in some countries, controlled by very few producers. For example:

- in USA, the first two producers hold 2/3 of the market; the first three 75%;
- in Europe, the first two hold 40% of the total market;

- in Italy, the first two hold 45% of the market; in France, 80%; in Germany, 60%; in Spain and Greece, 50%; in Benelux, 80%; in Venezuela, Brazil, and Argentina, 50%.

The market of pasta products in the Philippines

In 1990, the market of pasta products recorded a volume of nearly 23.000 t for a value of 642 million pesos.
In spite of its small dimensions, it is a fairly enough developed market, as it is shown by the large preference (82%) given to the medium/high price segment, dominated by the Royal brand (68%) that found its image on key attributes such as not sticking, firmness, and good quality/value for money, as to say high quality pasta.
The pasta market has the following characteristics:

- long cut goods (spaghetti) enjoy 68% of the total market;
- * short cut goods (macaroni) has a 26% share;

- the remaining 6% covers flat noodles, lasagna, twists and other shapes.

- as for price, the market is segmented in:

premium/high price (1%)	imported brands (Buitoni/Agnesi)	Price index	124
medium/high price (82%)	local production (Royal-Home Pride)		95-97
	Piccolino		84
medium price (7%)	Mama Mia		68
low price (10%)	Ideal/Generwe		42
	California		47

* (index 100= Royals's Spaghetti)

As for price structure, see the following table:

TYPICAL PRICE STRUCTURE PASTA

	Spaghetti 1kg x 16	macaroni 225g x 45
Suggested Retail Price with VAT		
Per Piece	32.60	9.90
Per Kg	32.60	44.00
Per Case	521.60	445.50
10% Value-Added Tax/Estimated Distribution Costs		
Per piece	8.49	2.54
Per kg	8.49	11.29
Per Case	135.89	114.27
Net Selling Prices		
Per Piece	24.11	7.36
Per Kg	24.11	32.71
Per Case	385.71	331.23

Notes:

1. the pasta brand belongs to the regular price market segment.
2. prices are effective January, 1991.
3 estimated distribution costs include both retailer and distributor margins as well as freight expenses.

The producers and their activities.

Royal

It is the market leader (68%) and enjoys a very strong brand loyalty. Substantial investments are allocated to protect its position and develop the market. In 1990, expenses for advertising and promotion were 35 million pesos.

Home Pride

Home Pride is second with an estimated share of 12%. It spent P3.7 million in 1990 in advertising and promotion. The brand re-aired its "Roll It" thematic campaign on TV and radio, and ran a premium-on-pack promo during the fiesta season. However, the brand lost share in 1990 due to semolina supply problems during the peak months of October, December, and because of competitive pressures.

Universal Robina Corporation

URC'sMama Mia (7% share) aired new advertising that reinforced its positioning as the only spaghetti brand that is both delicious and economical. It lost share to the price brands in 1990.

RFM

RFM Swift's fielded Premium Piccolino Spaghetti as a new entrant in the third quarter of 1990, with print advertising, and an introductory 10% price-off.

Ideal

The low-price brands, like Ideal, eroded the shares of the key market players in 1990.

Consumption pattern
Main Purchaser/Users

The housewife is the main decision-maker, with some adult female members actively participating in the process. TV ads and store displays influence the purchase decision.

Usership cuts across all socioeconomic classes, with 74% coming from the broad C and D classes (lower income groups).
Pasta is consumed by all members of the family.

The distribution system is organized in: Supermarkets (51% followed by market stalls (24%) and groceries (20%). Market stalls and groceries become increasingly important points of purchase as socioeconomic class declines.

Importation

Approximately 10% of the market demand is covered by imported products.
In 1988, the Philippines imported 3.200 t of pasta for US$ 1.876.000. On account of the actual situation for 1990, this share is bound to decrease to the benefit of locally produced pasta.

Future outloook and general considerations

1. The current size of the pasta market is 23.0 million kilos, valued at P642.0 million. Of this market, the spaghetti variant accounts for 68%, with macaroni accounting for 26%.

2. It is believed that the current market for pasta is near to the saturation point of its existing users; but this user-base will expand in two (2) years as the potential market reacts to the multi-usage positioning of pasta entering different market segments.

This consumer reaction is, however, expected to be most immediate among the users of short goods.

The attached market charts cover the period 1989-1990 as actual bases and 1991-1995 as projections.

Forecasts for 1995 give a market of total 42.000 t for a value of 1.985.000 P.
The market shall be more balanced among long cut (58%), short cut (31%), and other shapes (11%).

Raw materials

Pasta is a very simple product. Major ingredients are semolina, soft wheat, and water. Both semolina and wheat flour are largely available in the Philippines.
Major sources of supply are the local milling companies. Since wheat is not widely cultivated in the Philippines, grains are imported from abroad and milled into flours by local milling companies, among which General Milling Co.
It has been already stated in this study that wheat enjoys a special import procedure.

Packaging materials

Pasta is packaged in plastic bags or in carton boxes. Bags are made of colour-printable film boxes are made of colour-printable carton. These are generally available in the Philippines.

Consideration on the specific project opportunity

Based on the above mentioned results and the following considerations, i.e.:

1. the Philipino pasta matket is estimated to double in volume and value in the next 5 years;
2. GMC is already producing pasta, mainly for export to USA;
3. USA in the reference market for GMC; in USA pasta consumption is booming and a positive trend is recorded in all countries;

4. production technologies are available for the processing of cereal flours (soft wheat) into pasta, giving a high quality product not bound to usage of semoilina, available only in some countries or suject to high import duties.

This specific project opportunity has envisaged the installation of a production line for long cut pasta goods, with an output ranging from 8.000 to 10.000 tons per year.
The size and type of plant has been defined according to the market trends, i.e. consumption growth in USA and the Philippines, and development degree of the Philipino and American markets as for product quality.
The investment required for production plant is approximately US$ 3.000.000.

A further evaluation of the economic return on the investment and on financing shall be the object of a separate pre-investment study, not foreseen in the reference terms of this project.

PASTA MARKET DATA
1989-1995

	1989 (ACT.)	1990 (ACT.)	1991 (PROJ.)	1992 (PROJ.)	1993 (PROJ.)	1994 (PROJ.)	1995 (PROJ.)
TOTAL MARKET							
Volume (MT)	18,595	22,686	24,954	27,450	31,567	36,303	41,748
Growth Rate		22%	10%	10%	15%	15%	15%
Value (P000)	481,722	642,864	782,225	951,919	1,213,481	1,547,801	1,982,200
BY PRODUCT							
LONG CUT PASTA							
Volume (MT)	13,202	15,446	16,219	17,354	19,263	21,767	24,161
Growth Rate		17%	5%	7%	11%	13%	11%
% Share	71%	68%	65%	63%	61%	60%	58%
Value (P000)	325,308	424,535	491,025	575,858	705,335	877,622	1,073,185
SHORT CUT PASTA							
Volume (MT)	4,649	5,904	6,967	7,942	9,451	10,869	12,934
Growth Rate		27%	18%	14%	19%	15%	19%
% Share	25%	26%	28%	29%	30%	30%	31%
Value (P000)	144,111	190,044	247,642	310,349	406,129	513,753	671,561
OTHERS							
Volume (MT)	744	1,362	1,743	2,196	2,833	3,654	4,604
Growth Rate		83%	28%	26%	29%	29%	26%
% Share	4%	6%	7%	8%	9%	10%	11%
Value (P000)	12,302	28,285	43,559	65,711	102,017	156,426	237,454

APPENDIX III

General Notes on FNRI Nutritional Program

APPENDIX III - General notes on FNRI nutritional program.
Instant powder baby foods and shaped cereals local production.

Within the nutritional program launched by FNRI, some pamphlets were published with recipes and indications for a local exploitation of available raw materials, and home preparation of instant powder baby foods and shaped cereals.

These pamphlets take into consideration the nutritional problems affecting the target population and the availability of raw materials.
From their analysis we can see that FNRI identifies as principal ingredients cereal flours (rice and corn) and protein flours (mongo, banana, coconut) together with milk.
In this way, the FNRI has launched an educational program for baby feeding, trying to solve the following problems:

-improve nutritional conditions of target population;
-educate to a correct consumption pattern to guarantee a regular growth of babies and children;
-make the population aware of nutritional problems and possible solutions at relatively low cost;
-exploit locally available raw materials.

INTRODUCTION

NUTRI-CRUNCH is a high-calorie, iron-rich protein snack food developed by the Food and Nutrition Research Institute, DOST as part of the national program to produce nutritious supplementary foods. An important ingredient is animal blood, a waste product derived from the slaughter-house industry. NUTRI-CRUNCH contains highly available iron, the mineral especially needed by young children as well as by pregnant women and nursing mothers to prevent or correct anemia.

To prepare NUTRI-CRUNCH, follow the steps below:

WHAT YOU NEED:

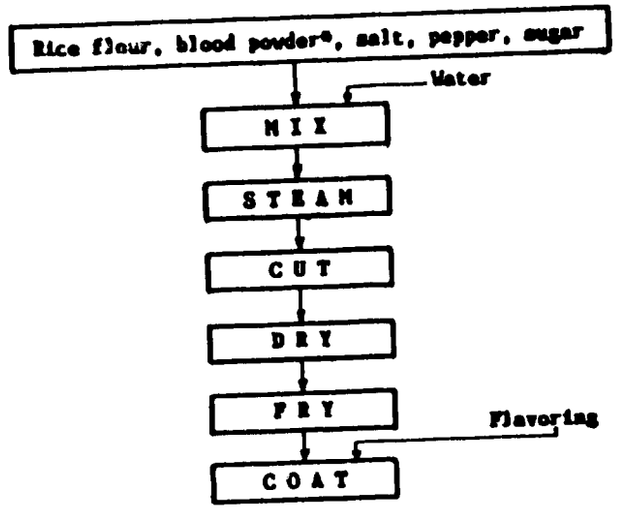
Rice flour (800 g)	- 6 3/4 cups
Skimmed milk (150 g)	- 1 3/4 cups
Animal blood powder (50 g)	- 1/3 cup
Sugar (20 g)	- 3 Tbsp
Salt (15 g)	- 1 1/2 Tbsp
Water (700 mL)	- 3 cups
Cooking Oil	- 2 cups
Artificial barbecue flavoring (60 g)	- 12 Tbsp

WHAT YOU USE:

- Mill
- Pulverizer (or corn mill)
- Aluminum Pans
- Grinder
- Cutter
- Cabinet/Solar dryer
- Frying pan
- Coating pan

Nutrient Composition per 100 g:

Protein	- 10 grams
Energy	- 499 calories



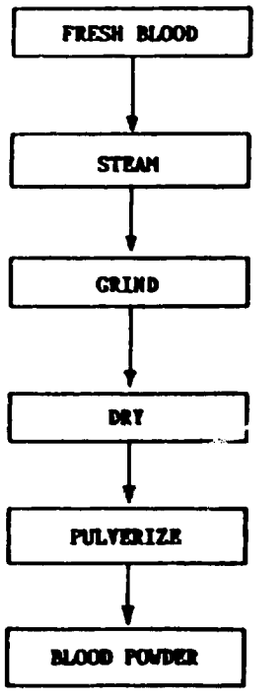
NUTRI-CRUNCHIES

*See steps in preparing blood powder at the back

HOW YOU DO IT:

1. Prepare rice flour by grinding raw rice in a pulverizer (or corn mill).
2. Mix rice flour, blood powder and seasoning.
3. Add water and stir thoroughly until a smooth dough is obtained.
4. Transfer dough into aluminum pan and spread it to approximately 1.3 cm thickness.
5. Steam the dough for 20 minutes.
6. Pass the dough through the cutter into desired shape and 2 mm thickness.
7. Dry the pieces of dough in a forced draft oven or solar dryer until brittle.
8. Deep fry dried pieces of dough until crunchies puff.
9. Add artificial flavoring to fried crunchies in coating pan.
10. Cover the coating pan and shake until the crunchies are evenly coated with the flavoring.
11. Pack crunchies in polyethylene bags.

FLOW DIAGRAM FOR THE PREPARATION OF ANIMAL BLOOD POWDER



HOW YOU DO IT

1. Clean container (aluminum or plastic pail) for collecting fresh blood thoroughly with soap and water.
2. Cover container to protect blood from flies and dust during collection and processing.
3. Put fresh blood in an aluminum pan and spread evenly to about 3.8 cm. thickness.
4. Steam blood for 10 to 20 minutes or until the blood coagulates.
5. Grind or finely chop the coagulated blood.
6. Place ground or chopped blood in a bamboo tray lined with cheesecloth or "katsa" and cover with sinamay cloth.
7. Dry blood in a cabinet dryer at 60°C or under the sun until crisp, turning over every hour.
8. Pulverize with the use of an "almires" or corn grinder.
9. Pack blood powder in a plastic bag and seal.

For further inquiries, please contact the:

Food & Nutrition Research Institute
Department of Science and Technology
Taft Avenue-Pedro St., Ermita, Manila

NUTRI-CRUNCH

FNRI-81-FT-4
Revised, May 1990

INTRODUCTION

To meet the need for low cost high protein foods among preschoolers, FNRI food technologists have continuously worked with traditional foods such as corn and mongo, which are common in the rural areas.

Various snack food products have been developed like corn-mongo crunchies.

Corn-mongo crunchies fortified with Vitamin A, thiamine, riboflavin and niacin compare very well in acceptability with the less nutritious commercial samples.

WHAT YOU NEED:

Corn Flour (800 g)	– 5¼ cups
Mongo Flour (200 g)	– 1¼ cups
Water (900 mL)	– 5 cups
Vitamin Mix	
Cooking Oil	– 2 cups
Flavoring (Cheese or barbecue 10 g)	– 2 Tbsp

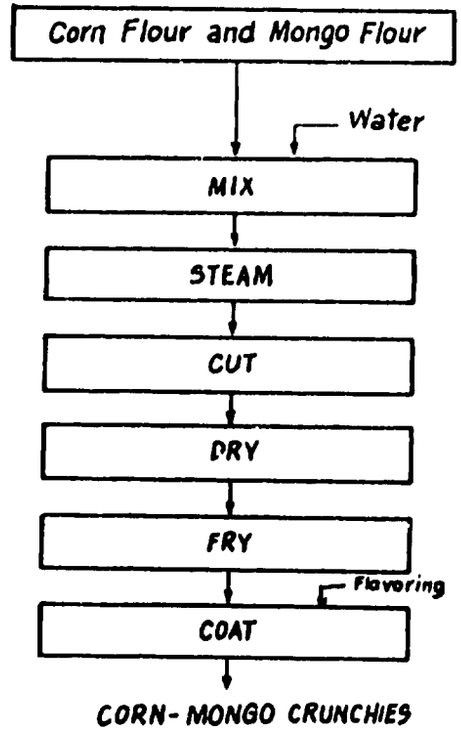
WHAT YOU USE:

Bowl	Steamer
Teaspoon	Cutter
Tablespoon	Cabinet dryer/solar dryer
Measuring cup	Fryer
Mixer	Coating pan

HOW YOU DO IT

1. Prepare corn and mongo flour by grinding raw corn and mongo beans separately in a pulverizer.
2. Mix 5¼ cups corn flour and 1¼ cups mongo flour.
3. Add water and vitamins to the flour mixture.
4. Stir the mixture thoroughly until a smooth dough is obtained.
5. Transfer dough into aluminum pans to approximately 1.3 cm thickness.
6. Steam the dough in a steamer for 20 minutes.
7. Pass the dough through a cutter to desired shape and 2 mm thickness.
8. Dry strips in a cabinet dryer for two hours at 60-65°C or solar dryer.
9. Deep fry dried strips until golden brown.
10. Transfer fried strips to coating pan and dust with artificial flavor until the strips are evenly coated.
11. Pack in polyethylene bag.

FLOW DIAGRAM FOR THE PREPARATION OF CORN - MONGO CRUNCHIES



SOME TIPS FOR GOOD NUTRITION

Attend to the food needs of your infant and pre-school children first before serving the other members of your family. Give them more energy-rich foods like kamote, gabi and other tubers.

A sick child needs complete nourishment to make him fight infection. Feed him with soft, nutritious foods like fish, beans, eggs, milk, vegetables and fruits. Consult a doctor for further advice.

Weigh your child every month to follow up his growth.

Serve a variety of foods everyday. No single food can provide all the nutrients the body needs.

Use fats and oils in preparing family meals for more energy.

Make green leafy and yellow vegetables a must in your daily meals.

Dried beans and legumes like *munggo, utaw, kadyos,* etc. have almost the same body-building substances found in fish, meat, poultry or eggs. For good nutrition, cook beans and legumes with a small amount of fish or meat.

Wash your hands with soap and water before cooking and eating and after using the toilet. Wash raw fruits thoroughly before eating. Protect your food from rats, flies, cockroaches and other insects. They transmit germs [illegible].

Produce foods your family needs for good nutrition - grow yellow *kamote*, banana, *sitaw*, or *kadyos, malunggay*, and papaya or guava tree in your home garden; raise also some poultry for eggs and hogs for meat and extra income.

Prepared and Printed

by

Food and Nutrition Research Institute
Department of Science and Technology

For further details, please contact:

Food and Nutrition Research Institute
Department of Science and Technology
Taft Avenue--Pedro Gil St., Ermita, Manila
Tel. Nos.: 59-51-13; 50-30-41 loc. 24

CORN-MONGO CRUNCHIES

INTRODUCTION

Calorie-protein malnutrition specially among infants and pre-schoolers is a major health problem in the country. Most Filipino mothers wean their infants on a diet of either rice gruel or "lugaw" or a highly diluted milk formula, both of which are inadequate in calories and protein.

Coconut is one of the potential sources of good quality vegetable protein. The preparation of an instant high calorie-protein product from coconut protein in combination with rice and nonfat dry milk has been developed at the Food and Nutrition Research Institute, DOST. An instant weaning product has the advantage of being simple to prepare for feeding because it does not require cooking before serving. Hot water is simply added to make a gruel of desired consistency.

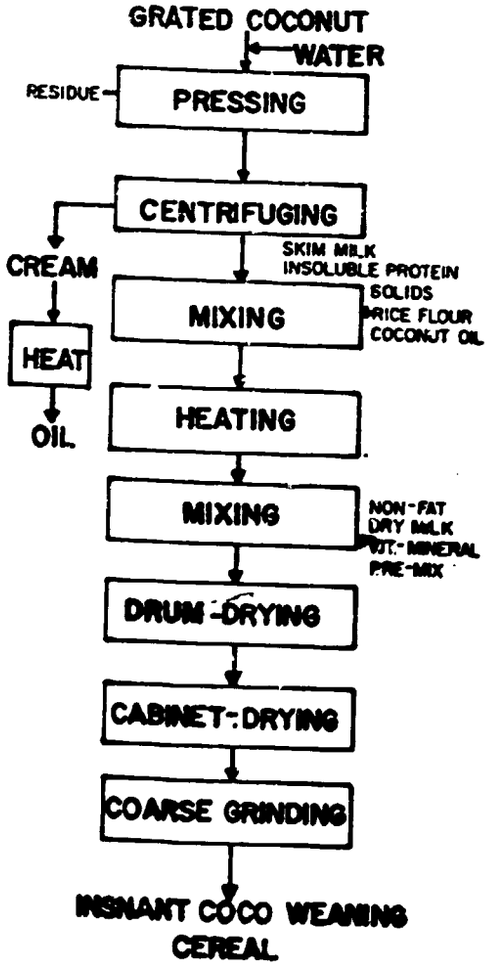
RAW MATERIALS

- grated coconut
- rice flour
- coconut oil
- nonfat dry milk

EQUIPMENT

- Mechanical Press
- Threeway-Centrifuge
- Drum-dryer
- Cabinet dryer
- Grinder

FLOW DIAGRAM FOR COCO WEANING CEREAL



INSTANT COCO WEANING CEREAL

PROCEDURE:

1. Add 1 part water to 1 part finely grated coconut meat, press to extract milk.
2. Pass coconut milk thru a threeway-centrifuge to separate the cream, skim milk and insoluble protein solids.
3. To every 1 liter of skim milk, add the following:

   80 grams rice flour
   17 grams insoluble protein solids
   1 ml coconut oil
4. Pre-cook mixture by heating at 80°C for 20 minutes.
5. Add 14 grams nonfat dry milk and vitamin-mineral premix.
6. Pass through a double drum dryer to form thin sheets.
7. Dry sheets in a cabinet dryer at 75°C for 10 minutes. Grind in a coarse mill.
8. Pack in flexible films or carton boxes.

For further inquiries, please contact:

Food & Nutrition Research Institute
Department of Science and Technology
Taft Avenue-Pedro Gil Street
Ermita, Manila

FNRI-80-FT-2
Reprinted, September 1989

RODUCTION

Mongo is not only a common food item in the/ pino meals but it also has protein, the nutrient ded by infants, preschoolers, schoolchildren, gnant and lactating mothers, particularly those nourished ones. However, much time and fuel spent in cooking mongo.

To make mongo an easy-to-serve supplement- food for the intended users, the Food and Nutr- n Research Institute,NSTA has developed a nut- ous mongo soup powder. The product is made n a blend of powdered mongo grits, cornstarch, ted onions and seasonings.

Enterprising individuals and groups can mass duce this product for sale to the community thus, help generate income for the producers.

AT YOU NEED

mongo grits (860 g)	— 4½ cups
cornstarch (20 g)	— 3½ Tbsp
grated onions (10 g)	— ¼ tsp
vegetable oil (100 g)	— ½ cup
salt (20 g)	— 7 tsp
water (1,500 ml)	— 6 cups

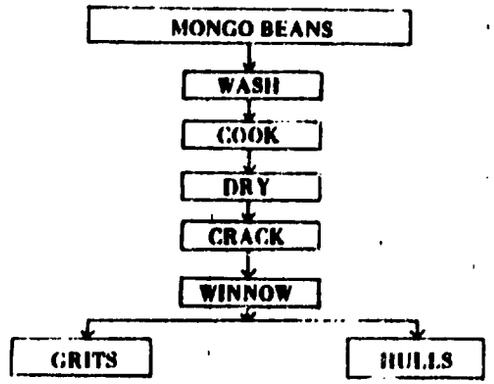
AT YOU USE

bowl
teaspoon
Tablespoon
measuring cup
grinder
mixer
nylon mesh
steamer
tumbler mixer
forced draft oven or solar dryer

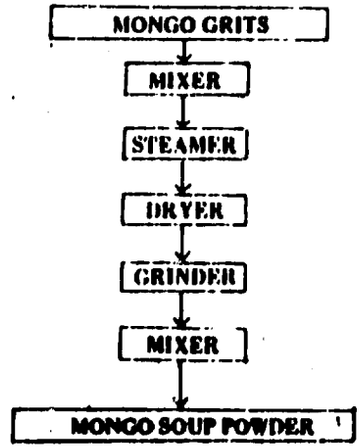
HOW YOU DO IT

1. Wash 6 cups of mongo beans with water.
2. Boil 6 cups of water, add beans and continue boiling for 20 minutes.
3. Dry boiled mongo beans in a forced draft oven or solar dryer until thoroughly dry.
4. Crack dried beans using a rolling pin and winnow to remove hulls.
5. Measure 4½ cups of mongo grits in a mixing bowl.
6. Add 3½ tablespoons cornstarch, ¼ teaspoon grated onions, 7 teaspoons salt and 6 cups water.
7. Mix well all ingredients.
8. Transfer mixture to a steamer lined with nylon mesh and steam for 30 minutes.
9. Dry the steamed mixture in a forced draft oven or solar dryer for 7 hours at 70-75°C.
10. Grind dry mixture into powder.
11. Transfer the mongo soup powder to a rotary tumbler and spray vegetable oil evenly.
12. Pack mongo soup powder in polyethylene bags.

FLOW DIAGRAM FOR THE PREPARATION OF MONGO GRITS



FLOW DIAGRAM FOR THE PREPARATION OF MONGO SOUP POWDER



HOW TO PREPARE INSTANT MONGO SOUP WITH GREEN LEAFY VEGETABLES USING MONGO SOUP POWDER:

Ingredients:

mongo soup powder (100 g)	1 cup
malunggay leaves (23 g)	2 Tbsp
water (1500 ml.)	6 cups

Procedure:

Add 2 cups (500 ml.) of water to mongo soup powder to make a paste. Boil the remaining amount of water and add the mongo soup paste to the boiling water together with the malunggay leaves. Stir and boil for 3 more minutes. Serve hot.

Other green leafy vegetables such as alli leaves or sampalaya leaves may be used in place of malunggay leaves.

SOME NUTRITION TIPS:

- Attend first to the food needs of your infant and preschool children before serving the other members of the family. Give them more energy-rich foods like kamote, gabi and other tubers.
- Weigh your child every month to follow up his growth.
- Serve a variety of foods everyday. No single food can provide all the nutrients the body needs.
- Use fats and oils in preparing family meals for more energy.
- Make green leafy and yellow vegetables a must in your daily meals.
- If you are a pregnant or nursing mother, eat more of the body-building foods like fish, beans, kangkong, alugbati, petsay, saluyot and squash, and fruits (banana, papaya, guava) etc.
- Wash your hands with soap and water before cooking and eating and after using the toilet. Wash raw fruits and vegetables thoroughly before eating. Protect your food from rats, flies, cockroaches and other insects. They transmit germs and diseases.

oOo

Prepared and Printed

by

Food and Nutrition Research Institute, NSTA
Taft Avenue-Pedro Gil St., Ermita, Manila

For further details, please contact the:
Food Research Division
Food & Nutrition Research Institute
National Science & Technology Authority
Taft Avenue-Pedro Gil St., Ermita, Manila

MONGO SOUP POWDER

FNRI-81 FT 12
Revised July 1982

INTRODUCTION

Sesame is a very good source of protein. However, its potentials have not yet been fully utilized. Sesame or "linga" is often used only as garnish on buns, rolls and native snacks prepared from glutinous rice.

In support of "Linga sa Paligid-ligid" project of the Bureau of Agricultural Extension, (BAEX-MAF), a nutritious food formulation using sesame was developed by the Food and Nutrition Research Institute (FNRI-NSTA). This new product, Rice-Paayap-Sesame (RPS) weaning blend is an excellent supplementary weaning food for your baby.

WHAT YOU NEED TO PREPARE RICE-PAAYAP-SESAME (RPS) WEANING BLEND

Rice Paayap seeds Sesame seeds

WHAT YOU USE

household cup	winnower or "bilao"
tablespoon	nylon mesh
teaspoon	corn grinder
rolling pin or empty bottle	aluminum tray
cooking pot	

HOW TO PREPARE INDIVIDUAL INGREDIENTS FOR THE RICE-PAAYAP SESAME BLEND:

Rice:

Toast rice at moderate heat for 5 minutes. Cool and keep in tightly covered container.

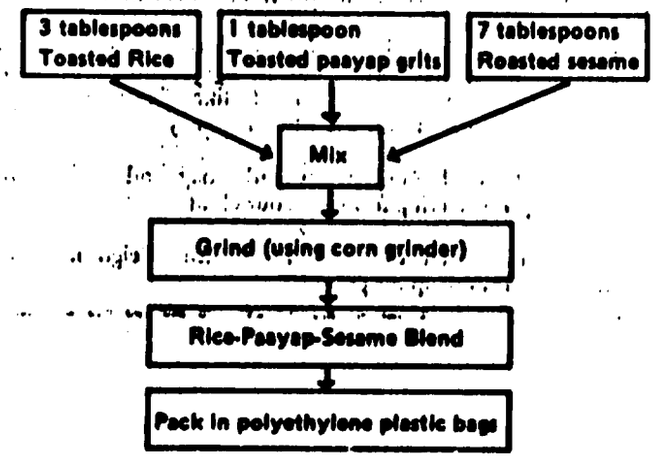
Paayap:

Toast paayap seeds at moderate heat for 5 minutes. Crack toasted paayap using rolling pin or empty bottle. Winnow paayap to remove hulls. Keep in tightly covered container.

Sesame seeds:

Wash unhulled sesame seeds twice. Soak overnight in water. Rub soaked seeds against nylon mesh to remove hulls. Wash thoroughly. Dry at room temperature for 24 hours and roast over low fire for 5 minutes. Keep in tightly covered container.

FLOW DIAGRAM IN PREPARING RICE-PAAYAP-SESAME WEANING BLEND:



Yield: 62 grams mixture

Nutritional value for 100 grams portion:

Fat - 11.1 grams
Protein - 14 grams
Energy - 429 kcal

HOW TO COOK RICE-PAAYAP-SESAME WEANING FOOD PORRIDGE

Ingredients:

2 1/2 tablespoons RPS Blend
1 cup water
1 teaspoon sugar

Procedure:

Add water to Rice-Paayap-Sesame powder and stir. Boil mixture in cooking pot for five minutes. Stir constantly to prevent scorching. Add sugar. Serve moderately hot.

SOME TIPS ON GOOD NUTRITION

- Attend first to the food needs of your infant and pre-school children before serving the other members of your family.
- Make "lugaw" (porridge) a good food for growth. Add body-building foods like fish, meat or eggs, munggo and other dried beans; and regulating foods like fruits, green leafy vegetables prepared in the right consistency.
- Be sure to wash your hands with soap and water before preparing and serving foods to your child.
- Weigh your child to check his health. Weigh him every month to follow up his growth.

Prepared and Printed

by

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Department of Science and Technology

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Department of Science and Technology
Taft-Pedro Gil Street, Manila
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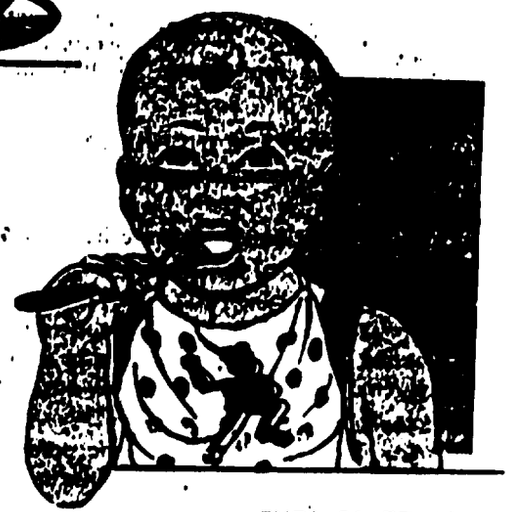
50-30-41 loc 24

Rice-Pazyap-Sesame *Weaning Food*



FNRI–86–FT–19
November 1988

INTRODUCTION

Banana is a common tropical fruit and is a good source of energy. Peanut is likewise a favorite nibble among children and adults, providing them a good amount of protein and fats. When mixed together, banana and peanut blend is a high-calorie, high-protein food best suited for growing children.

Formulated by the Food and Nutrition Research Institute (FNRI,NSTA), Banana-Peanut Supplementary Food is nutritious, low-cost and easy-to-prepare for pre-school and school age children.

What You Need

(For a 1 Kilo mix)

20 big pcs banana (saba), unripe
3/4 kilo, raw peanuts
2 3/4 cups + 6 tablespoons brown sugar
1 1/8 cup water

What You Use

knife
chopping board
corn grinder
aluminum tray
cooking pot
carajay

Procedure:

1. Boil green bananas (saba) until done. Peel and slice thinly.
2. Sun dry until crisp and grind into flour using a corn grinder. Set aside and place in a dry and clean covered container.
3. Toast peanuts over moderate heat for 15-20 minutes. Cool and remove skin manually.
4. Grind into powder using a corn grinder. Set aside and place in a dry and clean covered container.

Preparation for serving

1. Mix 1/3 cup of banana flour and 1/3 cup of peanut grits.
2. Add 1/3 cup brown sugar and boil mixture in 1 1/4 cup water for 3-5 minutes. Stir to prevent scorching. Serve moderately hot.

Yield: 1 cup or 320 grams

Nutrient composition for every 100 grams blend

Fat	26.1 grams
Protein	14.7 grams
Energy	507 kcal

One-half (1/2) cup of this porridge will provide your pre-school child 1-6 years old with 20% and 17% of his Recommended Dietary Allowances for energy and protein, respectively.

SOME TIPS ON GOOD NUTRITION

- Attend first to the food needs of your infant and pre-school children before serving the other members of your family.
- Make "lugaw" (porridge) a good food for growth. Add body-building foods like fish, meat or eggs, munggo and other dried beans; and regulating foods like fruits, green leafy vegetables prepared in the right consistency.
- Be sure to wash your hands with soap and water before preparing and serving foods to your child.
- Weigh your child to check his health. Weigh him every month to follow up his growth.

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Banana Peanut Mix

Supplementary Food

FNRI-86-F1 18
November 1988

INTRODUCTION

Rice-Mongo-Sesame mix or RMS blend is an ideal supplementary food for weaned infants and pre-schoolers. It contains high amounts of protein and calories needed for optimum body growth and constant supply of energy that will sustain their daily activities. The mix is made from a blend of locally grown nutritious food items namely rice, mongo and sesame which are commonly found throughout the country.

Developed by the food technologists of the Food and Nutrition Research Institute (FNRI, NSTA), the formulation can be made using home or village level processing technology and is convenient and easy to use.

WHAT YOU NEED TO PREPARE R–M–S BLEND

Mungbeans
Sesame seeds
Rice
Water
Sugar

WHAT YOU USE

household cups
tablespoon
teaspoon
rolling pin or empty bottle
winnower or "bilao"
nylon mesh
corn grinder
[illegible]
cooking pot

HOW TO PREPARE THE INDIVIDUAL INGREDIENTS FOR THE RICE–MONGO–SESAME BLEND

Rice:

1. Roast 1 cup of any variety of rice at moderate heat for 5 minutes. Keep in tightly covered container.

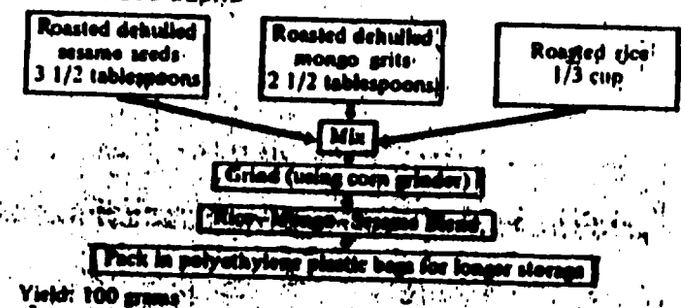
Mongo grits:

1. Roast 1 cup of mungbeans at moderate heat for 5 minutes.
2. Crack roasted mungbeans using rolling pin or empty bottle to dehull.
3. Winnow mungbeans to remove hulls. Keep in tightly covered container.

Sesame seeds:

1. Wash unclehulled sesame seeds two times.
2. Soak the seeds overnight in water.
3. Rub soaked seeds against nylon mesh to remove hull.
4. Wash dehulled seeds thoroughly.
5. Dry at room temperature for 24 hours.
6. Roast over slow fire for 5 minutes. Keep in tightly covered container.

FLOW DIAGRAM IN PREPARING RICE–MONGO–SESAME WEANING FOOD BLEND



Nutrient Composition per 100 gram sample (3/4 cup)

Fat – 12.8 g
Protein – 13.2 g
Energy – 444 kcal
Calcium – 147 mg
Iron – 2.5 mg

HOW TO COOK RICE–MONGO–SESAME WEANING FOOD PORRIDGE

Ingredients:
RMS Blend – 10 g (2 1/2 tablespoons), Water – 220 mL (almost 1 cup), and Sugar – 5 g (1 teaspoon)

Procedure:

Add water to rice-mongo-sesame powder and stir. Boil mixture in cooking pot for 5 minutes. Stir constantly to prevent scorching. Add sugar. Serve moderately hot.

Yield: 1 1/2 cup

1 1/2 cup (1 1/2 servings) or approximately 346 grams of the cooked Rice-Mongo-Sesame weaning food will provide your 1–3 year old child with 17% and 14% of his Recommended Dietary Allowance (RDA) for energy and protein, respectively.

SOME TIPS ON GOOD NUTRITION

* Attend to the food needs of your infant and pre-school children first before serving the other members of your family.

* Make "lugaw" a good food for growth. Add body-building foods like fish, munggo and other dried beans, meat or eggs, and regulating foods like fruits, green leafy vegetables prepared in the right consistency.

* Weigh your child to check his health. Weight him every month to follow up his growth.

* Be sure to wash your hands with soap and water before preparing and serving foods to your child.

—***—

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Department of Science and Technology
Taft-Pedro Gil Street, Manila
Tel. Nos : 59-51-13
50-30-41 loc. 24

Rice - Mongo - Sesame

Weaning Food

FNRI 85 FT 16
Reprinted, November 1989

APPENDIX IV

List of Sources

APPENDIX IV - LIST OF SOURCES

- Food Processing Equipment Survey: Philippines (Italian Trade Commission, Manila, Philippines, 1987)

- Le Filippine: Guida per l'esportatore Italiano, ICE, Roma, 1991

- Composition of Foods: Cereal Grains and Pasta (U.S. Dept. of Agriculture, 1989)

- Regional Updating of Nutritional Status of Filipino children, 1989-1990 - FNRI, Manila, Ottobre 1990

- Third Nutritional Survey, Philippines 1987 (FNRI, Maggio 1989)

- Report on population (FNRI, 1985)

- Set of brochures on recommended food items (FNRI, 1982-88) for home preparation.

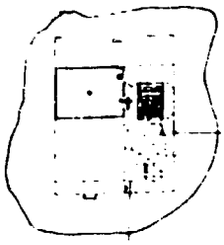
  Philippines Agribusiness Factbook and Directory 1989/90 (Center for Research and Communication)

- General Statistical data from various sources (Business Statistical Monitor, Central Bank of Philippines)

DIAGRAMS

DIAGRAM 1

General Milling Corporation



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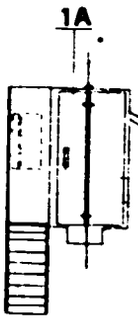

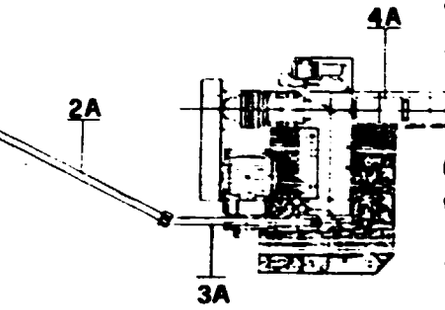

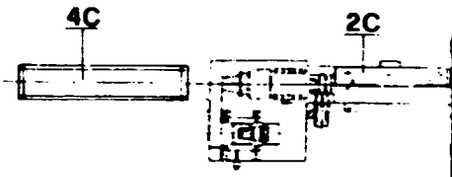

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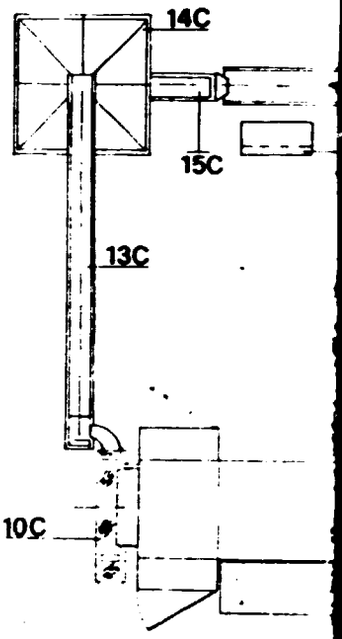
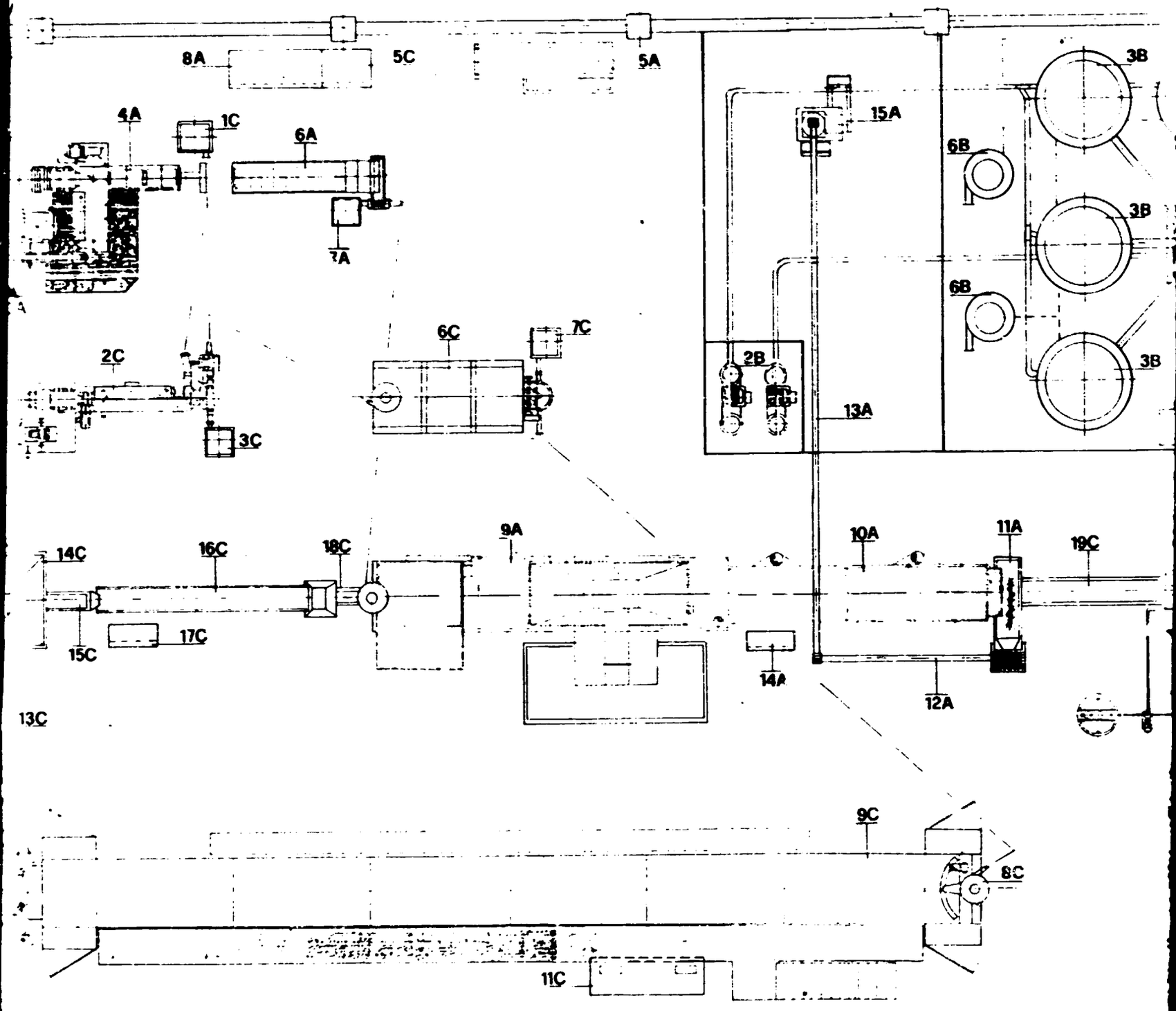


SECTION 1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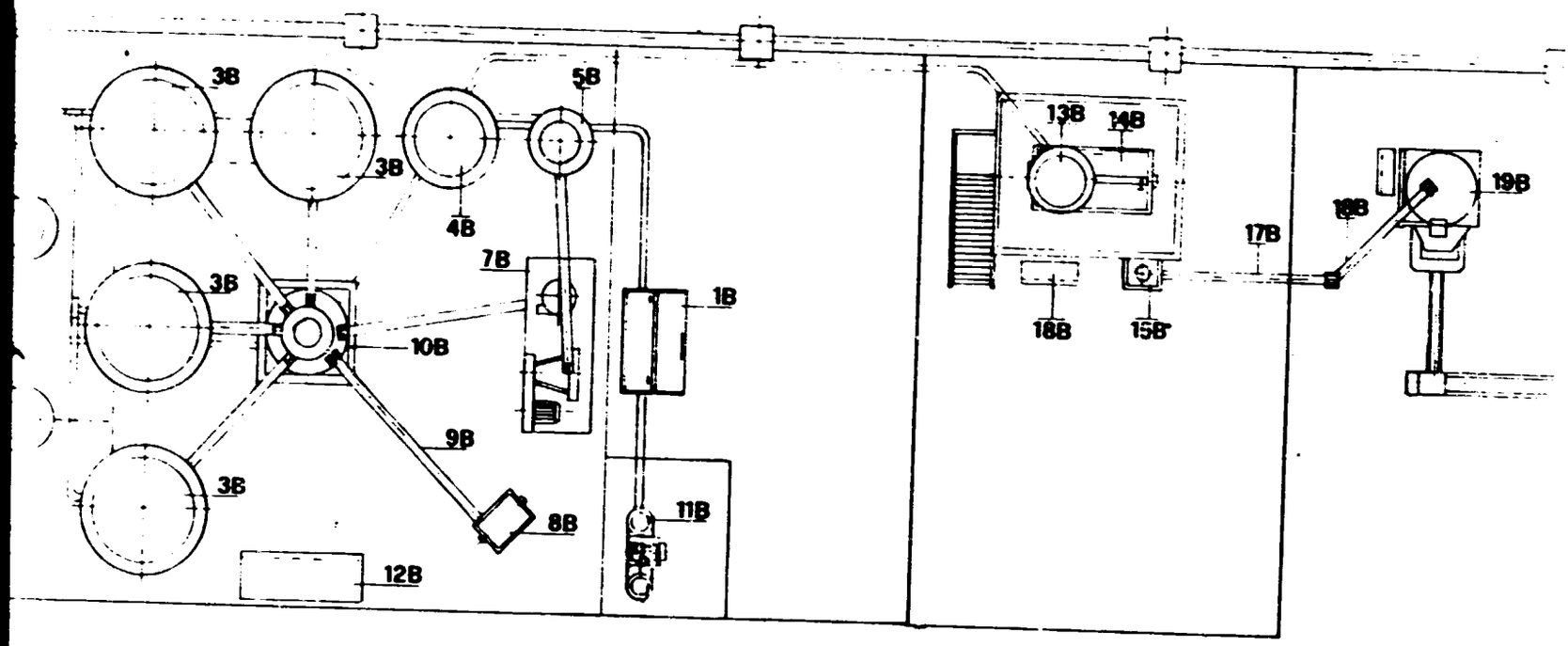
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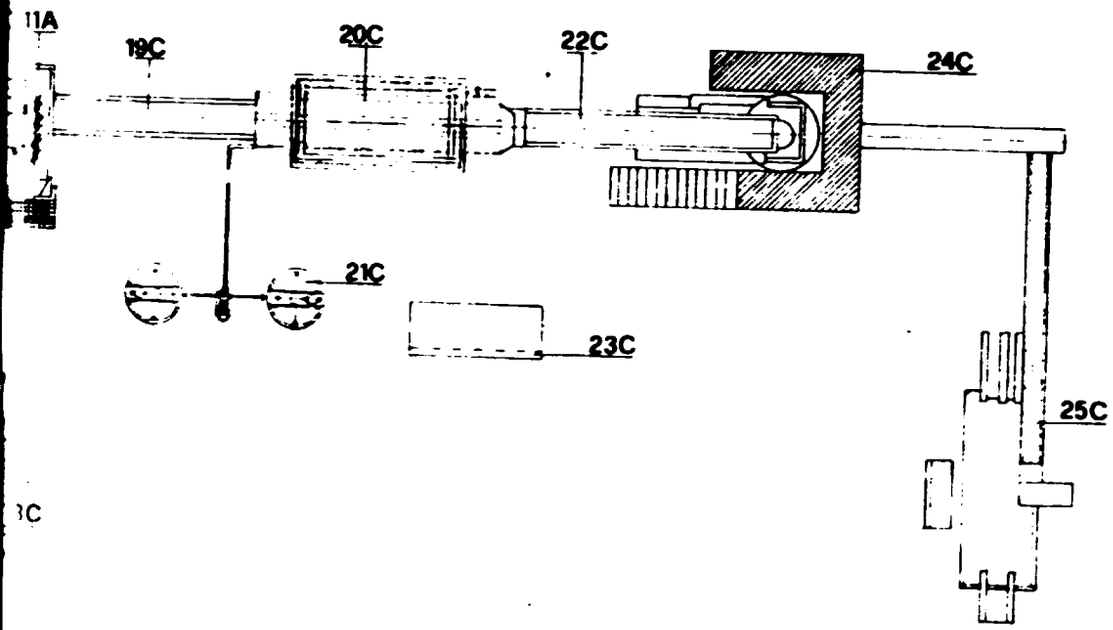
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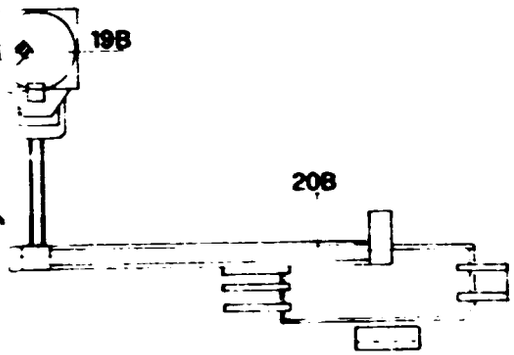

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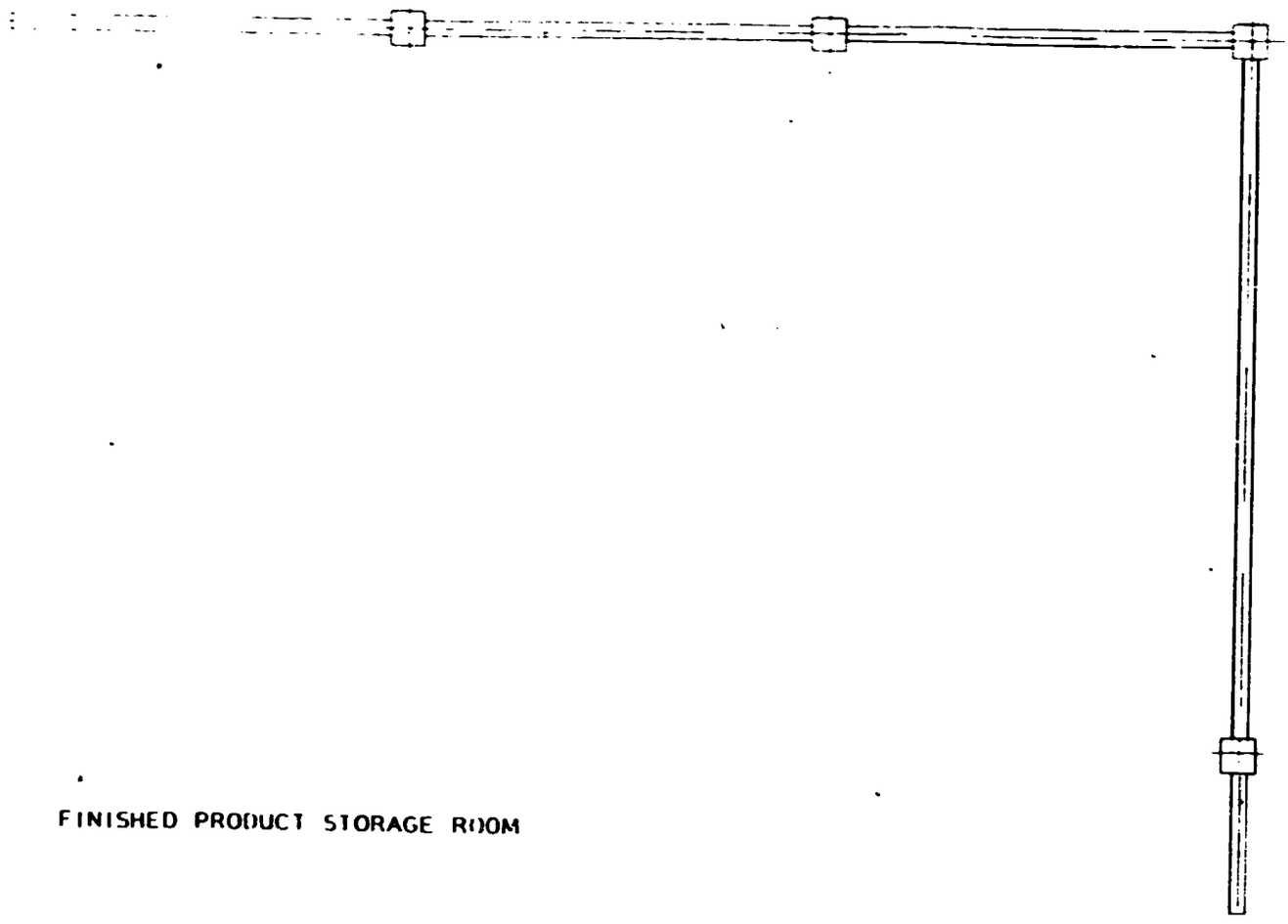
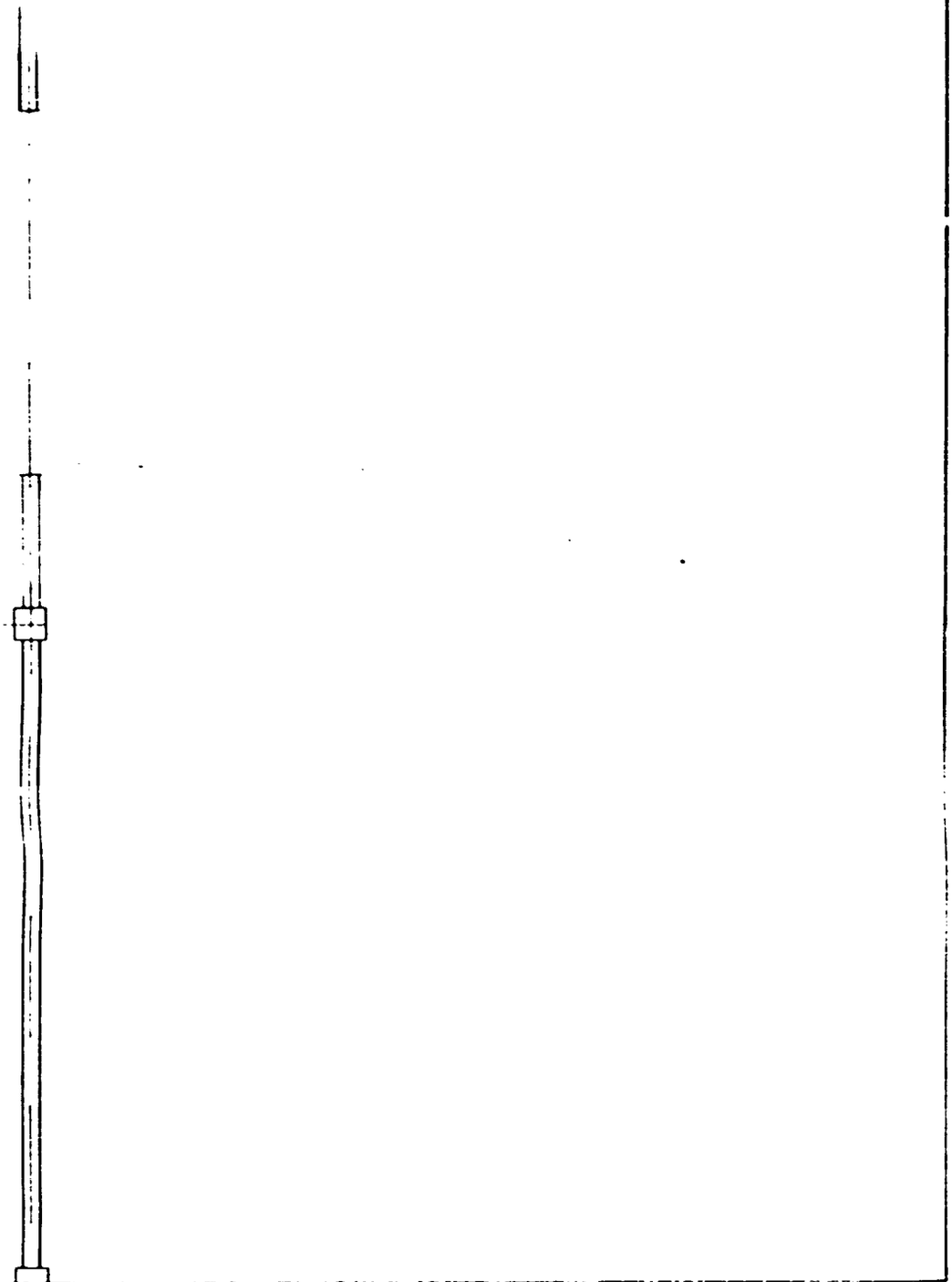
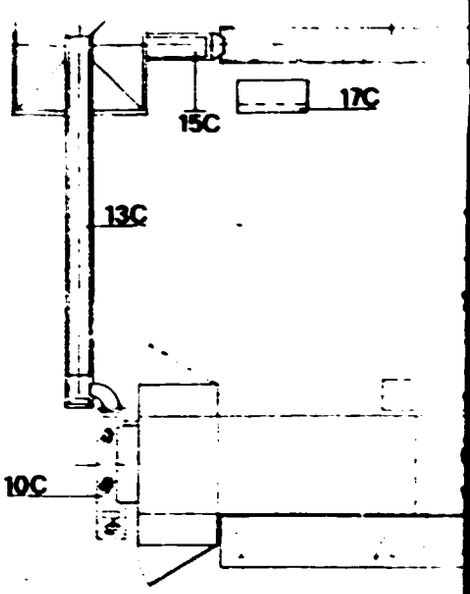
SECT 4



FINISHED PRODUCT STORAGE ROOM

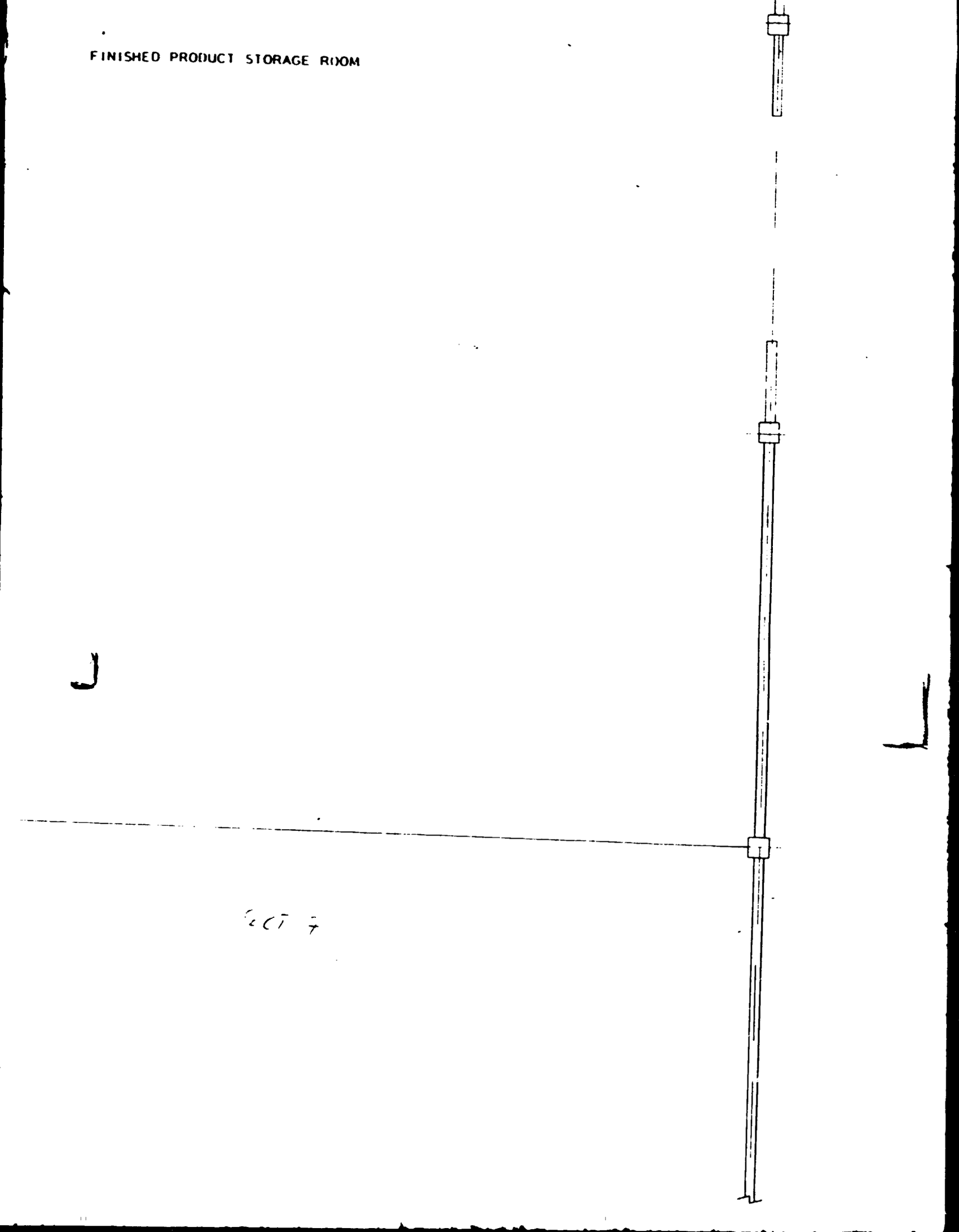
SECT E





Sec 6

FINISHED PRODUCT STORAGE ROOM



A) LINE FOR PRECOOKED FLOURS PRODUCTION, CAP. 350KG/HR

1A HORIZONTAL MIXER FM700
(COMPLETE WITH CONTROL PANEL)
2A VERTICAL FEEDING SCREW FS500/V
3A HORIZONTAL FEEDING SCREW FS500/O
4A GELATINIZER G502
5A SCREW EXTRACTOR SE/G/502
6A CUTTING SYSTEM SCP500
7A PNEUMATIC CONVEYOR PC500/SCP-BTO
8A CONTROL PANEL 4A+7A
9A BELT TOASTING OVEN BTO 500
(HEAT EXCHANGER)
10A COOLING BELT CC70/5000
11A VIBRE SCREEN VS120
12A FEEDING SCREW WITH HOPPER FSH500
13A FEEDING SCREW FS500/V
14A CONTROL PANEL 9A-13A
15A GRINDING SYSTEM (COMPLETE WITH CONTROL PANEL)

B) ADDITIONAL MACHINES TO SECTION A) FOR THE PRODUCTION OF BABY FOOD, CAP. 650KG/HR

1B BAG EMPTYING HOPPER
2B PNEUMATIC CONVEYOR
3B PRECOOKED FLOURS STORAGE BINS (COMPLETE WITH EXTRACTION SCREWS)
4B MILK STORAGE BINS (COMPLETE WITH EXTRACTION SCREWS)
5B SUGAR STORAGE BINS (COMPLETE WITH EXTRACTION SCREWS)
6B POWDER FILTER
7B SUGAR GRINDING SYSTEM
8B HORIZONTAL MIXER FM50
9B FEEDING SCREW FS100/V
10B AUTOMATIC SCALE
11B PNEUMATIC CONVEYOR
12B CONTROL PANEL 1B-11B
13B STORAGE BIN
14B HORIZONTAL MIXER FM700
15B CENTRIFUGE SIEVE
16B FEEDING SCREW FS700/V
17B FEEDING SCREW FS700/O
18B CONTROL PANEL 13B-17B
19B VERTICAL PACKAGING MACHINE (COMPLETE WITH CONTROL PANEL)
20B AUTOMATIC CARTONING MACHINE (COMPLETE WITH CONTROL PANEL)

C) ADDITIONAL MACHINES TO SECTION A) FOR THE PRODUCTION OF TOASTED PELLETS (SAVOURIED), CAP. 500KG/HR

1C PNEUMATIC CONVEYOR PC500/G-F
2C FORMER F500
3C PNEUMATIC CONVEYOR PC500/F-TM
4C SCREW EXTRACTOR SE/F/500
5C CONTROL PANEL 1C+4C
6C SHAKER PRE-DRYER TM500
7C PNEUMATIC CONVEYOR PC500/TM-CD
8C VERTICAL SPREADER SP120
9C CONTINUOUS DRYER CD120/500/5/18
10C VIBRE SCREEN VS120
11C CONTROL PANEL 6C+10C
12C DIE WASHING MACHINE LT500
13C ELEVATOR BELT EB350/6000
14C STORAGE BINS
15C VIBRE SCREEN VS120
16C BELT CONVEYOR BC350/5000
17C CONTROL PANEL 13C+16C
18C PONDERAL DOSER PD500 (COMPLETE WITH CONTROL PANEL)
19C ELEVATOR BELT EB350/3000
20C FLAVOURING TUMBLER FT500
21C FLAVOURS MIXER MT300/2
22C ELEVATOR BELT EB350/5000
23C CONTROL PANEL 19C+22C
24C VERTICAL PACKAGING MACHINE (COMPLETE WITH CONTROL PANEL)
25C AUTOMATIC CARTONING MACHINE (COMPLETE WITH CONTROL PANEL)

SECT 4

TECHNICAL DATA

INSTALLED POWER:

1A	FM700	9 KW
8A	CP/4A-7A	128KW
14A	CP/9A-13A	24KW
12B	CP/1B-11B	53KW
18B	CP/13B-17B	13KW
19B	PACKAGING MACHINE	8KW
20B	CARTONING MACHINE	5KW
4C	CP/1C-4C	77KW
11C	CP/6C-10C	56KW
12C	DIE WASHING MACHINE	12KW
17C	CP 13C+16C	3KW
18C	PONDERAL DOSER	0,5KW
23C	CP/19C-22C	11KW
24C	PACKAGING MACHINE	8KW
25C	CARTONING MACHINE	5KW

SECT. 1C

POTABLE WATER CONSUMPTION: PRESSION 1,5bar ± 0,5 bar

4A G502	250l/h, Temperature at 25-70°C
2C F500	500l/h, Temperature at 70°C for head heating for 15'-20'min.

INDUSTRIAL WATER CONSUMPTION FOR COOLING: PRESSION 1,5bar ± 0,5 bar

4A G502	1300l/h) Temperature at 15°C
2C F500	1200l/h) Δt = 10°C

THERMIC INSTALLED POWER:

9A	BTO 500	350.000 Kcal/h Gasoline heating
6C	TM500	35.000 Kcal/h } H2O at 95°C, Δt = 3°C
9C	CD120/500/5/18	140.000 Kcal } Pressure 1,5 bar ± 0,5 bar

AIR COMPRESSED CONSUMPTION: 800 Nl/h for the whole plant

250l/h, Temperature at 25-70°C

500l/h, Temperature at 70°C for

head heating for 15'-20'min.

ATER CONSUMPTION FOR COOLING: PRESSION 1,5bar ± 0,5 bar

1300l/h) Temperature at 15°C

1200l/h) Δt 15°C

ALLED POWER:

350.000 Kcal/h Gasoline heating

35.000 Kcal/h } H2O at 95°C, Δt = 3°C

140.000 Kcal } Pressure 1,5 bar ± 0,5 bar

/18

ED CONSUMPTION: 800 Nlt/h for the whole plant

Sect. 11

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GENERAL MILLING

OBTAINED FROM N°	REPLACES N°	REPLACED BY N°	DATE	SIGNATURE	SCALE
			26-7-91		1:50

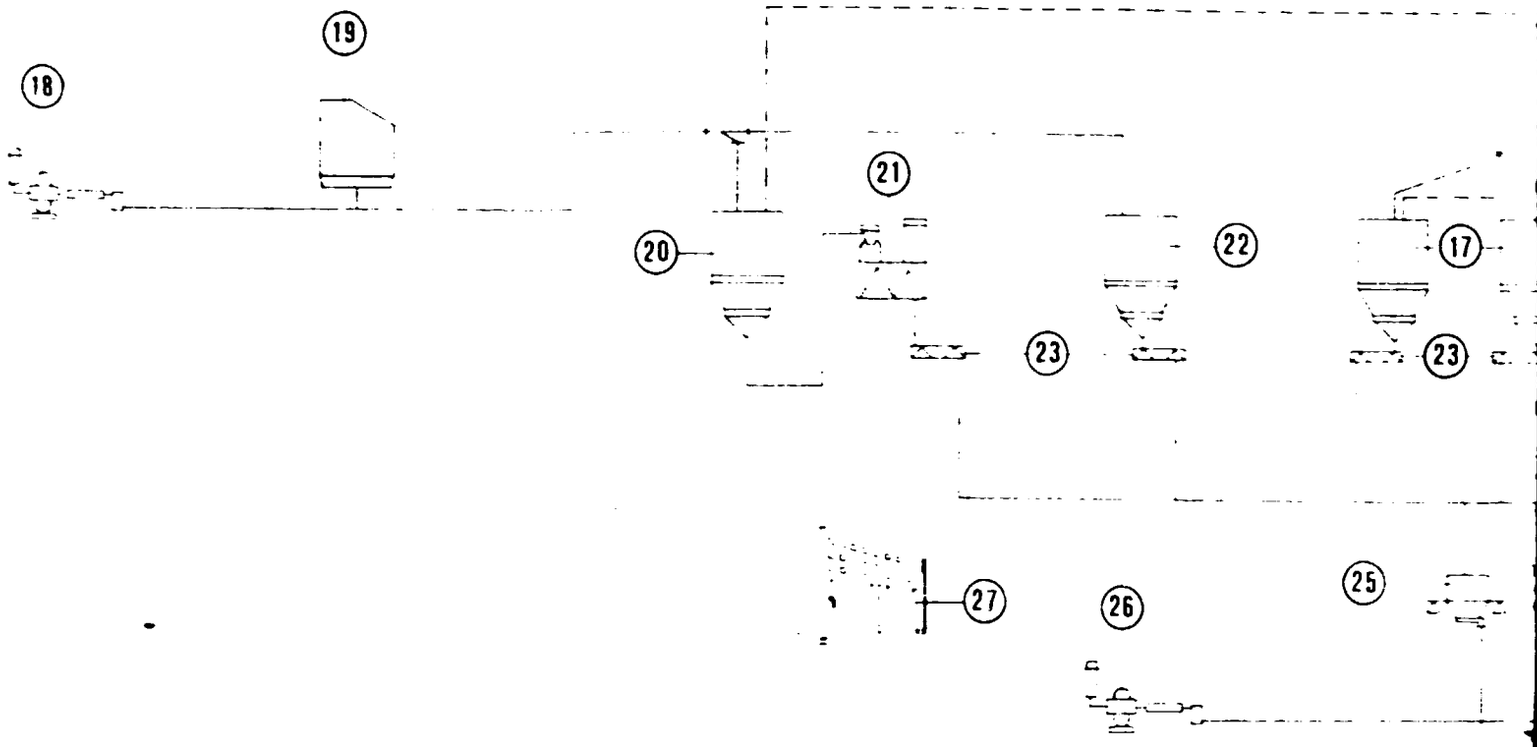
DIAGRAMS MAKING UP THE DRAWING

DRAWING N°

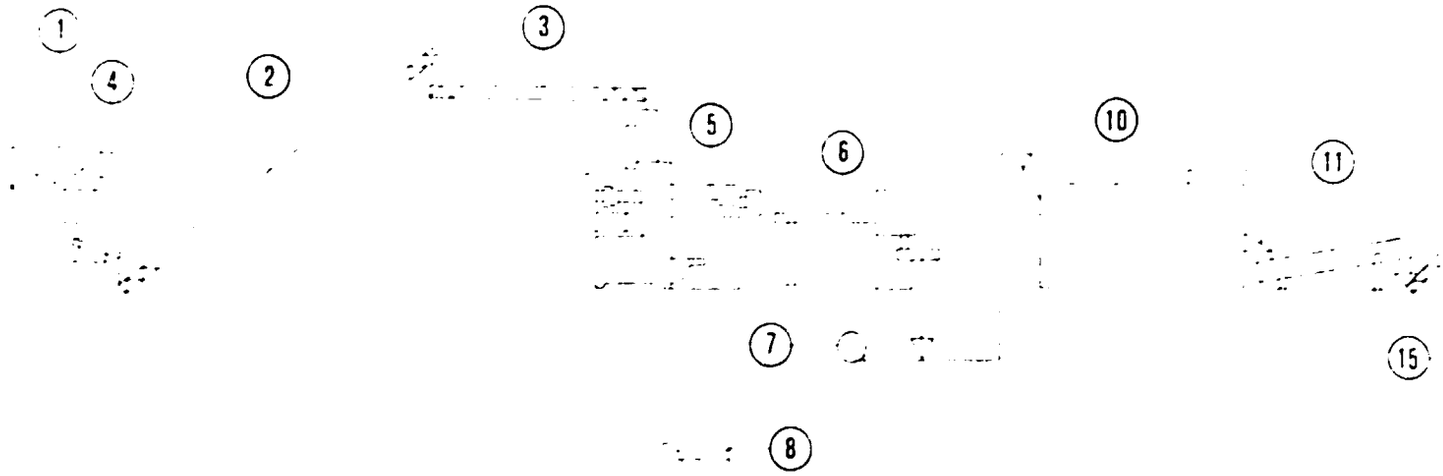
3606 SV

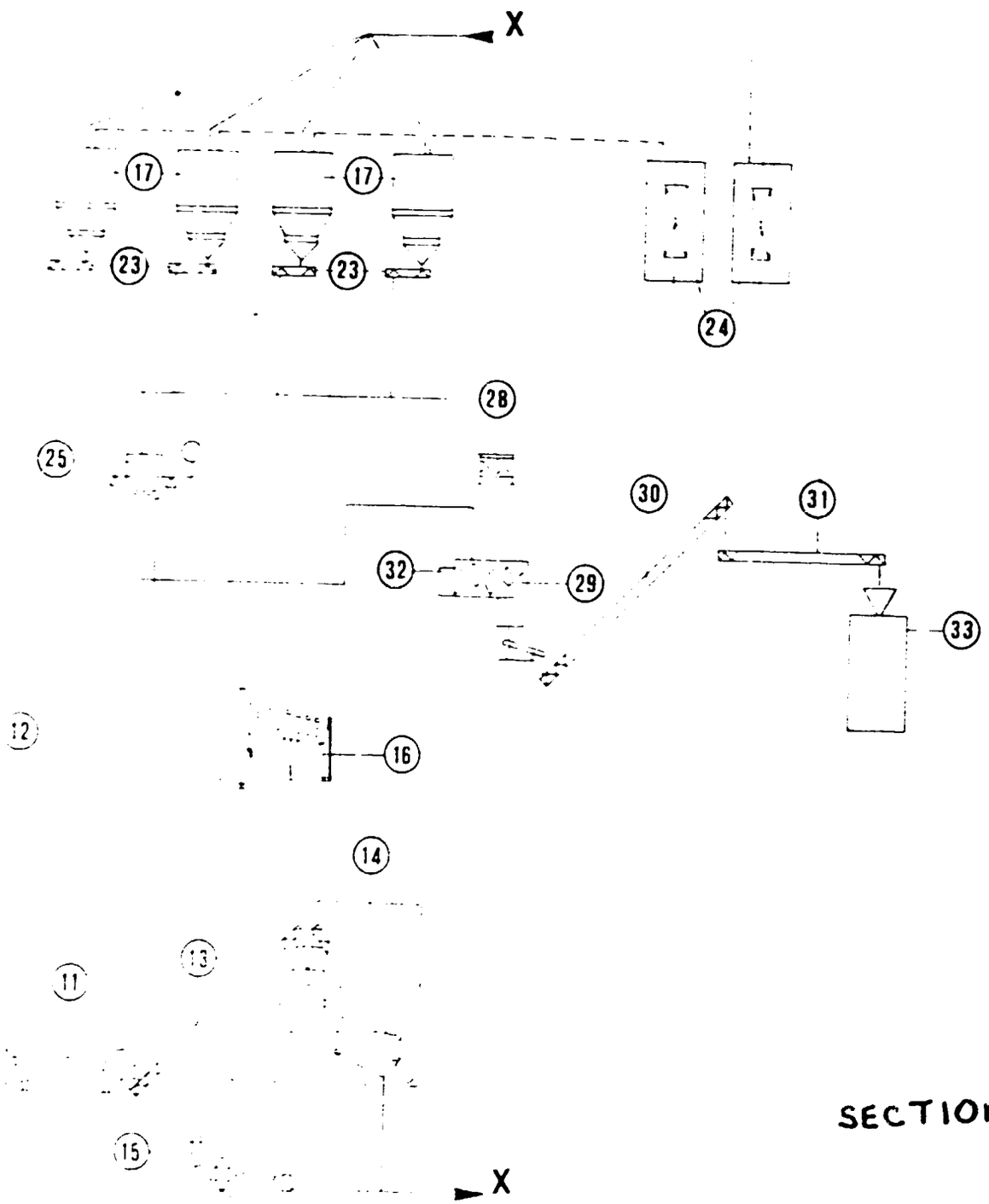
DIAGRAM 2

Baby Food Production Line



SECTION 1





SECTION 2

1) HORIZONTAL MIXER
2) VERTICAL FEEDING SCREW
3) HORIZONTAL FEEDING SCREW
4) CONTROL PANEL CP 1-3
5) GELATINIZER
6) CUTTING GROUP
7) PNEUMATIC CONVEYOR
8) SCREW EXTRACTOR
9) CONTROL PANEL CP 5-8
10) BELT TOASTER
11) COOLING BELT
12) CONTROL PANEL CP 10-11
13) VERTICAL FEEDING SCREW
14) GRINDING SYSTEM
15) PNEUMATIC CONVEYOR
16) CONTROL PANEL CP 13-15
17) STORAGE SILOS
18) PNEUMATIC CONVEYOR
19) BAG EMPTYING HOPPER
20) SUGAR STORAGE SILOS
21) SUGAR GRINDING MILL
22) MILK STORAGE SILO
23) SCREW EXTRACTION
24) POWDER FILTERS
25) AUTOMATIC SCALE
26) PNEUMATIC CONVEYOR
27) CONTROL PANEL CP 17-26
28) MICROCOMPONENTS MIXER
29) HORIZONTAL MIXER
30) VERTICAL FEEDING SCREW
31) HORIZONTAL FEEDING SCREW
32) CONTROL PANEL CP 29-31
33) PACKAGING MACHINE

SECTION 3

SECTION 4

0 1 AGO. 1991

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GALLIERA VENETA - ITALIA

BABY FOOD PRODUCTION LINE

OBTAINED FROM N	REPLACES N	REPLACED BY N	DATE	SIGNATURE	SCALE
			26 7 91		

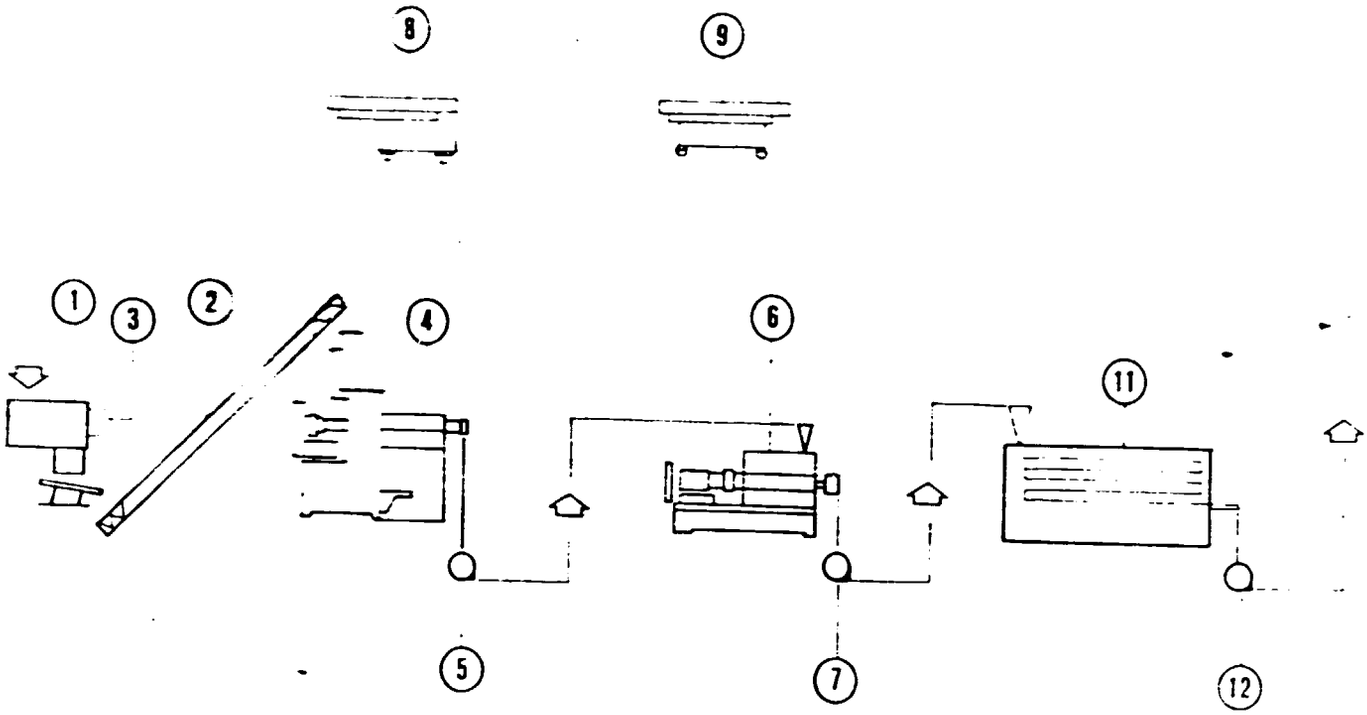
DIAGRAMS MAKING UP THE DRAWING

DRAWING N

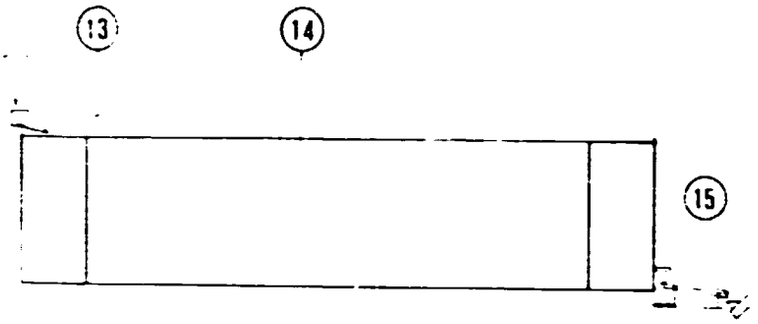
3607 SV

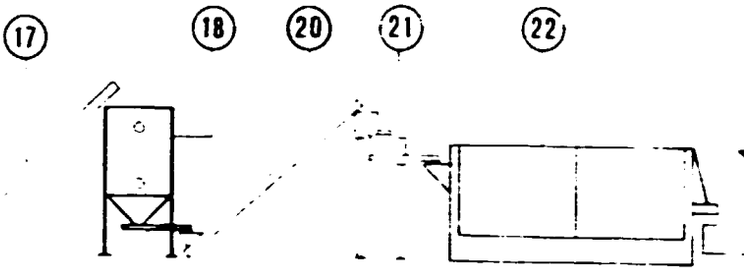
DIAGRAM 3

Line for the Production of Toasted and Flavoured Pellets



SECTION 1





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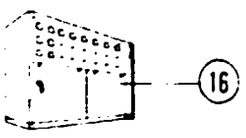
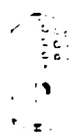
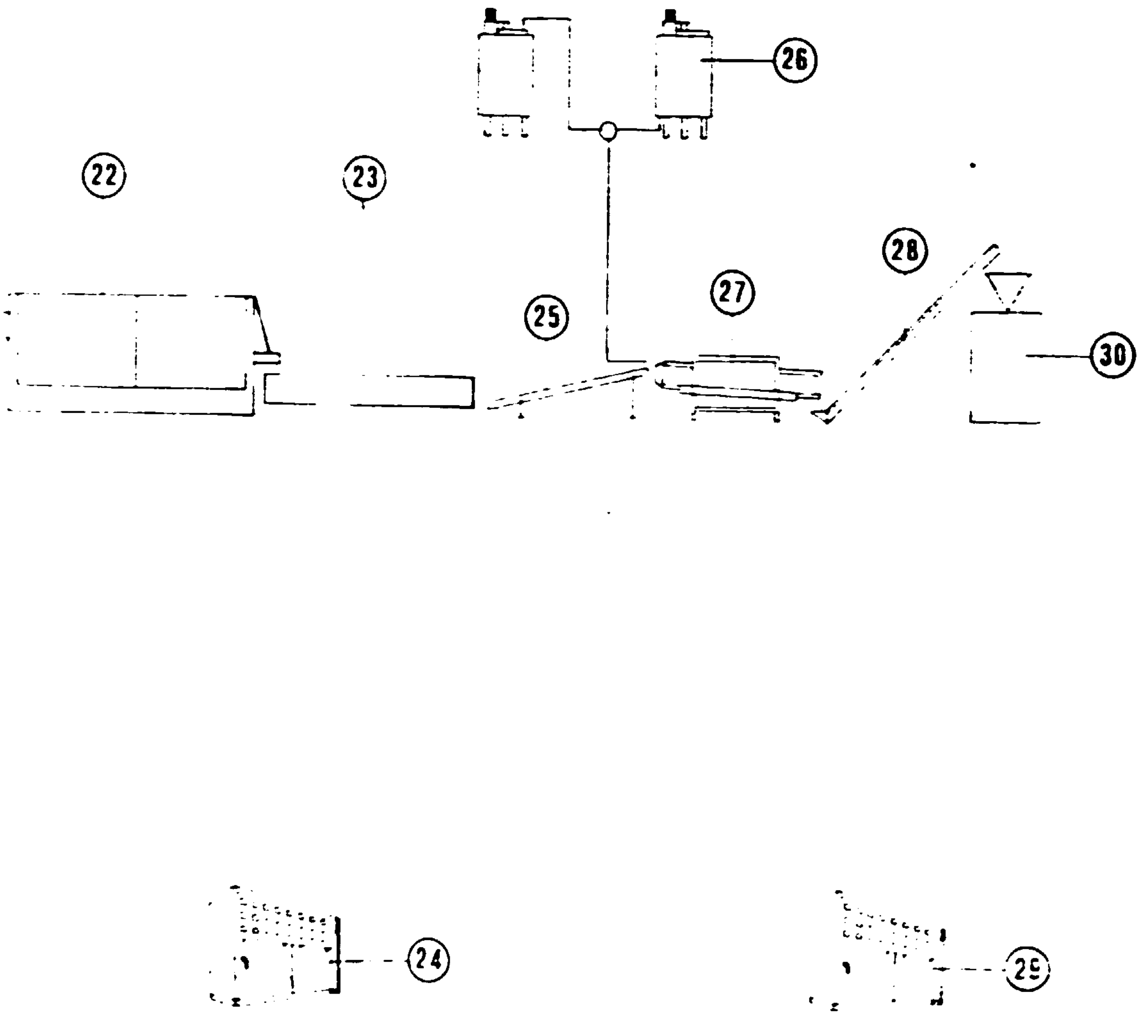




SECTION 2



SECTION 3

1) HORIZONTAL MIXER
2) VERTICAL FEEDING SCREW
3) CONTROL PANEL CP 1-2
4) GELATINIZER
5) PNEUMATIC CONVEYOR
6) FORMER
7) PNEUMATIC CONVEYOR
8) GELATINIZER SCREW EXTRACTOR
9) FORMER SCREW EXTRACTOR
10) CONTROL PANEL CP 4-9
11) SHAKER PRE-DRYER
12) PNEUMATIC CONVEYOR
13) PRODUCT SPREADER
14) CONTINUOUS DRYER
15) VIBRE SCREEN
16) CONTROL PANEL CP 11-15
17) ELEVATOR BELT
18) STORAGE BINS
19) VIBRE SCREEN
20) ELEVATOR BELT
21) PONDERAL DOSER
22) BELT TOASTER
23) COOLING BELT
24) CONTROL PANEL CP 17-23
25) ELEVATOR BELT
26) FLAVOURS DOSER
27) FLAVOURING TUMBLER
28) ELEVATOR BELT
29) CONTROL PANEL CP 25-28
30) PACKAGING MACHINE

SECTION 4

SECTION 5

0 1 AGO. 1991

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GALLIERA VENETA - ITALIA

LINE FOR THE PRODUCTION OF TOASTED AND FLAVOURED PELLETS

OBTAINED FROM N	REPLACES N	REPLACED BY N	DATE	SIGNATURE	SCALE
			26 7-91		

DIAGRAMS MAKING UP THE DRAWING

3608 SV